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FEBRUARY 1993

# AIRPLANE

THE WORLD'S PREMIER R/C MODELING MAGAZINE

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PILOTS**

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GENERATION!**

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# MODEL AIRPLANE NEWS

THE WORLD'S PREMIER R/C MODELING MAGAZINE

## FEATURES

**16**

### RPM ENGINE REVIEW

Extra punch in a  
.60-size package  
*by David Gierke*

**20**

### RIVETS AND GRAPHICS

From the master of iron-on  
covering techniques  
*by Faye Stilley*

**38**

### THE MURDER OF A STARSHIP

A scratch-building  
masterwork and an  
unsolved mystery  
*by Thomas L. Krasin &  
Daniel L. Scherry*

**53**

### NORTHEAST SAILPLANE ALCYONE

FIELD & BENCH REVIEW  
For the budget-minded  
sailplane pilot  
*by Jim Simpson*

**56**

### HOW TO MAKE SMOKE WITH YOUR G-62

Instructions to install  
B&B's smoke system  
*by Rich Uravitch*

**61**

### MAT EXTRA 300 FIELD & BENCH REVIEW

A look at a  
TOC-level airplane  
*by George Jenkins*

**70**

### THE 1992 MADERA UNLIMITED RACES

The biggest racers  
push the limit  
*by Rob Wood*



**ABOVE:** the Alcyone, a low-cost, high-performance sailplane from Northeast Sailplane Products.

**ON THE COVER:** the tension mounts just moments before the Bronze trophy race at the Madera Unlimited Races. (Photo by Tom Atwood.)

**81**

### THORPE ENGINEERING FUNHAWK

FIELD & BENCH REVIEW  
A quick-build,  
fun-fly alternative  
*by Ron Black*

**94**

### '92 KRC ELECTRIC FLY

Electric continues  
to evolve  
*by Bill Griggs*

**108**

### WING DESIGN, PART 2

Insights for  
model designers  
*by Andy Lennon*

## HELICOPTER SECTION

**99**

### SCHLUTER CUP '92

East Coast heli competition  
*by A.E. Stanley*

**102**

### ROTARY-WING ROUNDUP

## CONSTRUCTION

**30**

### FUN FLY HOTS

The next generation  
*by Dan Santich*

**42**

### LIL' EASY

Budget flier  
*by Randy Randolph*

## COLUMNS

**11**

### AIR SCOOP

*by Chris Chianelli*

**49**

### VIDEO VIEWS

*by Jef Raskin*

**66**

### SIMPLE PROGRAMMING

*by David C. Baron*

**86**

### GOLDEN AGE OF RADIO CONTROL

*by Hal DeBolt*

**132**

### CENTER ON LIFT

*by Michael Lachowski*

## DEPARTMENTS

**7**

### EDITORIAL

**8**

### AIRWAVES

**24**

### PILOT PROJECTS

**46**

### HINTS & KINKS

**107**

### NAME THAT PLANE

**115**

### BUYERS' MART

**125**

### CLUB OF THE MONTH

**138**

### AD INDEX

# Jeff Troy says "I wouldn't think of covering a model without one of these!"

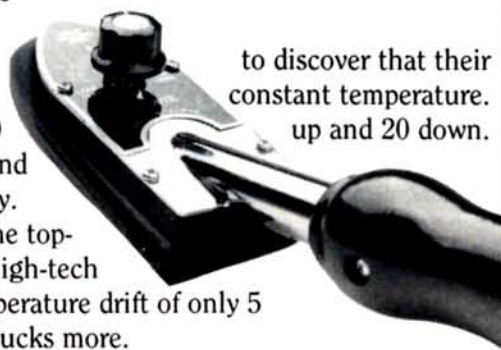


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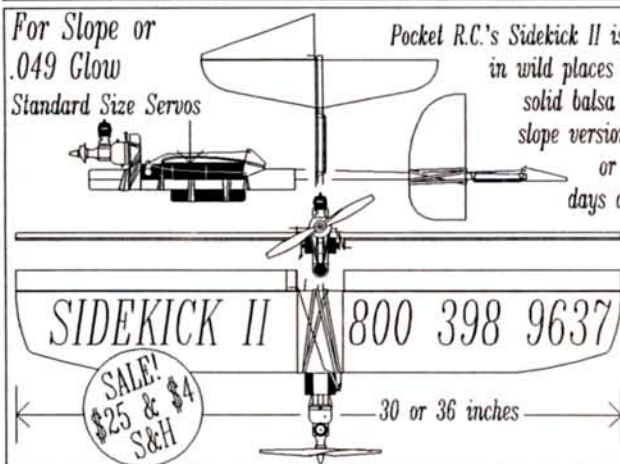
In addition, the Black Baron Iron has unique roll bars on the sides that fit neatly into fillets and undercambers. It's coating is 100% Blackstone - a big improvement over the less expensive gray coatings.



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# EDITORIAL

T O M   A T W O O D

## AWESOME UNLIMITEDS

**B**ecause of the significance of the September '92 Unlimited races held in Madera and the volume of information worth reporting, we are covering these races in two installments. This issue includes an overview by Rob Wood and a pictorial. Next month, we will take a closer look at the technical achievements at the races.

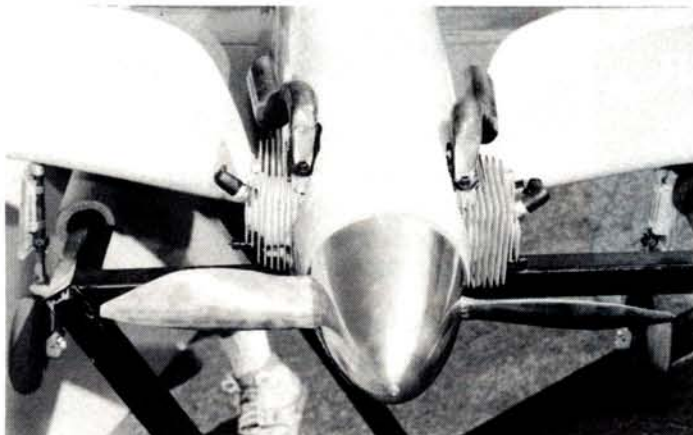
The growth of the Unlimiteds—and now the giant-scale AT-6 races—heralds a new era in R/C. Technologies developed for these races will probably advance the hobby for the sport flier. (These races have already stimulated the growth of a new generation of giant-scale retracts.) The races have added a dazzling spectacle that should also grab the attention of those involved in sports television programming. If broadcast, the Unlimiteds would popularize the sport of R/C like nothing previously. (Any sports programming staff among our readers?)

There is something about the large-scale racers, whether unlimiteds or AT-6s, that quickens the pulse and generates tremendous excitement among the spectators.

The planes themselves, although subject to a weight limit of 55 pounds, are of a scale and power level that seem closer to motorcycles than R/C models. Airframe construction ranges from traditional balsa and ply to all-glass-and-epoxy aircraft with honeycomb and composite construction. Some of the newer ships are being built using a shell composite construction previously seen in the most sophisticated R/C sailplanes and in some full-scale experimental aircraft. Coming on line are new engines that may bring Gold race speeds much closer to the 200mph mark.

In the pit area, the mood and scale of the activity is more reminiscent of a big-time sporting event such as car or boat racing, or, for that matter, the full-scale Reno races. The activity in the pits never ceases; the machines are under constant attention, being fine-tuned for the next round.

AT-6 racing, which started at the latest



*Above: the business end of no. 00—the Mustang that took first place in Gold. Powered by an Aerrow 200s engine, this plane averaged 151mph in the trophy race. Below: editor Tom Atwood (right) talks with Don Rice, winner of the first-place trophy in Gold at the recent Madera Unlimited Races.*



Madera races, uses standardized engines and airframes and is therefore primarily a "skill" category. This is a welcome addition.

Several groups are attempting to organize additional unlimited and AT-6 races across the country. We have just received word that German organizers are putting together a series of four Unlimited Races to be held this year in Europe. We look forward to the growth of this sport, and (we hope) to seeing it on television. We know it would be a winner.

### BEHIND THE MADERA RACES

Behind the spectacle, there were several sponsoring organizations and a lot of hard-working people who volunteered their time. Pacer Technology (Zap), and RCD, Inc., were charter sponsors. Each put up more than \$5,000 in contributions (translation: seed monies). Robart, APC propellers, Airtronics, *Model Airplane News* and *RCM* were supporting sponsors, each making between \$1,001 and \$4,999 in contributions. Lanier RC, Powermaster, Byron Originals,

Aerrow, Inc., ISC International, JZ Products and Nick Ziroti were contributing sponsors. More such sponsors are needed to keep these races growing.

Individuals who gave generously of their time include Sam Wright, who, without relief, did a fine job as announcer; Cal Orr, the CD, who directed the races and led the pilots' meetings; and Leslie Burnett and Nancy Bridi, who coordinated the overall event. George Steiner was the technical expert on radio matters, and John Elliot was in charge of race control on the deck. Backing up John

as flight-line control were Steve Parola and Alan Pounds. Additionally, Jim Oreskovich, Frank Shears and John Hinton served as pylon judges. Fred Burgdorf of APC tirelessly aimed a radar speed gun.

A small army is needed for local logistics—including the provision of an off-site practice field. These services (and many workers) were provided by the Madera R/C Club. The Quarter Scalpers of Torrance, CA, also pitched in, as did the Byron Team. John Delk coordinated the setting up of much of the event.

Sam Schneider, airport manager, deserves thanks for his assistance in making the site available and for juggling the requirements of the local full-scale traffic. Dave Bridi provided race pylons and related equipment, and Nick Ziroti and Joe Bridi handled technical inspections. Racers who arrived in recreational vehicles were assisted by Bob and Lilly McClung, who managed the campground. Tom Nightingale, brought in the full-size T-6 and the BT13, and the P-51 Mustang, all of which wowed the crowds. Randy Difani also provided an AT-6. Micah Irvine kept the scores and provided printouts of rankings. Jean Bridi and Millie Targas ran the administrative office, and Robart provided assistance to race organizers and to many racers throughout the event. Thanks are owed to all of these contributors and volunteers, and to others not listed here. ■

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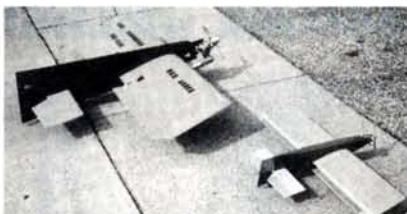
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# AIRWAVES

WRITE TO US! We welcome your comments and suggestions. Letters should be addressed to "Airwaves," **Model Airplane News**, 251 Danbury Road, Wilton, CT 06897. Letters may be edited for clarity and brevity. We regret that, owing to the tremendous numbers of letters we receive, we cannot respond to every one.



### FRIENDSHIP NOT FOR SALE

I was delighted to see Blaine Stetler's "Not For Sale" in the "Pilots' Projects" section of the August '92 issue of *Model Airplane News*.

Blaine moved from our area to Florida several years ago. He needed a better climate to remain active. We still miss him. He taught many of our fliers and, owing to the quality of his training, his graduates are still active in R/C.

I'm enclosing a photo of our "Not For Sale" collection. The R/C one is a joint venture for our local club; I furnished the supplies, Walter Griffith built it, and Bob Johnson is the pilot. Bob, with one year of flying experience, is a very capable flier. He feels that the "Not For Sale" is the best sport airplane he has flown. With large control surfaces, it turns like a control-line stunt model, but the large wing and lightness permit gentle, easy landings. It's really a great design.

The smaller model is my UC stunt plane, which is powered by a TD .051. I'm a recent R/C convert from UC stunt. The design seems to be a natural for UC and was too much to resist.

Again, I'm very happy to see Blaine receive recognition for his efforts. He is a remarkable person who shares his gift of time with others—first, with his family and then with anyone who is interested in airplanes. I admire his courage and perseverance and am honored to be included in his large circle of friends.

DON TICHENOR  
Angola, IN

*Thanks for your comments, Don. After receiving your letter, we jumped on the phone and called Blaine. He kindly agreed to send plans and a construction article for a version that will fly using a .32 to .46 2-stroke. We are looking forward to the article and think there will be a lot more Not-For-Sales in the air soon!*

TA

### CANOPY PLASTICS REVISITED

I read with interest Clarke Smiley's article (Oct. '92) on vacu-forming canopies. I, too, was obliged to "re-invent" this process for a scratch-building project, and my conclusions were, in most respects, identical to those of the author. However, I would like to offer some suggestions and corrections.

As a technical sales rep in the plastics industry, I feel some clarifications on plastic material selection are in order. Most important, polystyrene and vinyl are not even remotely related. The following outline on physical properties illustrates this point:

**Polystyrene:** easy to vacu-form, but has poor fatigue-resistance (vibration will cause it to develop stress cracks) and poor UV resistance (exposure to sunlight will cause it to become brittle). Also is subject to attack by most paint solvents. Clear (crystalline) styrene is extremely brittle, and high-impact styrene is of course opaque, and therefore makes a poor canopy. For all these reasons, polystyrene is a poor choice for R/C applications.

**Vinyl (PVC):** polyvinyl chloride is easy to vacu-form, has good fatigue resistance, and it's resistant to chemical attack. It has better UV stability than styrene, but clear vinyl tends to yellow with age. Most adhesives don't work well with vinyl, although I've been told that PFM is suitable.

**ABS:** acrylonitrile-butadiene-styrene is easy to vacu-form, has excellent fatigue resistance (for a thermoplastic), and is reasonably easy to paint. Being opaque, it isn't suitable for canopies, but it's nearly ideal for wheel pants, cowls, and other formed parts.

**Butyrate:** vacu-forms well and has reasonably good fatigue resistance. It's clear and tough, but CA adhesives will attack it, so they should be avoided. *This is generally the best choice for most canopy construction.*

**Acrylic and polycarbonate:** although they're completely different resins, acrylic (Plexiglas) and PC (Lexan) are alike in that they're harder to vacu-form (owing to their high softening temperatures). Also, they're both extremely tough, have outstanding UV stability and are resistant to chemical attack.

Finally, I'd like to offer some suggestions concerning technique: when working

# AIRWAVES

with butyrate, it's a good idea to leave the blue masking film in place, although it must not be wrinkled. I built my forming box to fit my oven, and I use the broiler setting (upper heating elements) on low heat. My holder frame is elevated on guide rods, so when the magic moment arrives, it can be dropped directly down onto the plug and vacuum plate. All this is to prevent the plastic from cooling until the "pull" has been completed. Then, remove the works from the oven immediately.

Last but not least, to get good results, the plug, the plastic, and everything else must be surgically clean because any contaminant will show in the finished product. To repel dust particles, treat the sheet with anti-static (Static-Guard) spray.

I know this letter is rather lengthy, but I hope these suggestions will allow your readers to avoid some aggravating false steps, especially in the area of material selection.

JAMES C. RYAN  
Cincinnati, OH

Thank you for your comments, James. I and a lot of other modelers out there appreciate them, and I'm sure a number of modeling projects will have improved success because you took the time to share your expertise.

TA



## BULLETPROOF TRAINER

I am a 13-year-old boy who is interested in getting involved in R/C airplane flying. I was just wondering what would be some good first plane combinations for a mini budget? Would the AirCore 40 be a good choice? Oh yeah, I think this magazine is great!

DALEN KAHIAPO  
Kaneohe, HI

Dalen, the AirCore 40 (reviewed in the September '91 issue) is indeed a good choice for a first trainer. Its high-wing design and semisymmetrical airfoil provide a good, stable platform with which to learn primary

flight skills. It has a large wingspan (64 inches), and this makes it easy to see. Its "fold and fly" construction is unusual, but it is relatively easy to build. You use contact cement as the primary building adhesive. All the parts come die-cut and scored, so it's fairly easy to assemble. The AirCore material is very strong and completely fuelproof.

U.S. AirCore has incorporated its power cartridge system into the design so that you can easily remove the engine, fuel tank and radio and put it into another U.S. AirCore design.

Coupling this aircraft with any standard 4-channel radio and a good .40 to .45 2-stroke engine should have you earning your R/C wings with minimal effort, time and money. It's possible to build a less expensive first system of course, but this one is far more resistant to crashes and will get you "over the hump" with little or no repair time. Look for a used engine and radio to lower your overall investment, and good luck. For more information, contact U.S. AirCore, 4576 Claire Chennault, Hangar 7, Dallas, TX 75248; (214) 250-1914. GY

## DEPRESSING RUMORS!

I am told that as of the end of 1992, all R/C receivers must be dual conversion. Even though they are narrow-band and the transmitters have gold stickers, those radios are not legal for model aircraft flight. If this is true, that puts me out of the hobby. I have three Futaba 4NBL Attack AM radios and one MAX4 JR AM radio that will be considered junk as of January 1, 1993. I trusted the advice of the dealers when I purchased them.

Since I am retired and can't afford to change costly radio equipment every so often, what do I do now? The radios mentioned above were all bought in 1992, and the loss of their use is a considerable one. And that does not take into consideration the cost of the aircraft, engine and the time and energy put into their construction. The monetary loss alone is one that I, and probably many others, can't afford, especially at \$80 to \$90 for a converted receiver. Besides that, what other regulation comes

(continued on page 136)

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# AIR SCOOP

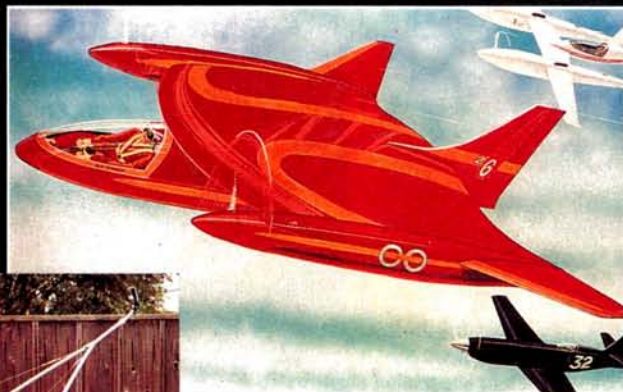
CHRIS CHIANELLI



*New products or people behind the scenes—my sources have been put on alert to get the scoop! In this column, you'll find new things that will, at times, cause consternation, and telepathic insults will probably be launched in my general direction! But who cares?—it's you, the reader, who matters most! I spy for those who fly!*

## SHIMMER'S ALIVE!

Dick Johnson of Dallas, TX, sent us these pictures after reading Frank Gudaitis' recent article (November '92 *Model Airplane News*) on Charles H. Zimmerman's Flying Flapjack, affectionately called Zimmer's Skimmer. Dick, who has been a modeler since before WW II, is currently testing this 1/2-scale model of a modern, UAV version of the Flapjack. Our 1947 cover, which featured the Navy Vought XF5U-1 Flapjack fighter, helped to inspire Dick to pursue a career in aviation. After working with Chance Vought for more than 20 years, he became a full-time inventor. Note the test rig—his creation—that permits measurement of all three axes during simulated flight.



Many will agree with Dick's off-the-cuff opinion that modelers can make significant contributions to aviation, and that "serious modelers know more about low-speed aerodynamics than the whole scientific community." The Flying Flapjack story is not yet over. We'll keep you posted on Dick's progress.

## Hard-Working Heli



Flight Craft Model Co., of Kitchener, Ontario, Canada, announces the availability of its new load-carrying R/C helicopter—the Beast. The giant chopper is powered by a Super Tartan twin-ignition engine and is designed for industrial applications such as aerial photography. It has a rotor span of 80 inches, a length of 66 inches and is 34 inches tall. The model is 22 pounds dry and can carry an additional payload of 20 pounds. It's available in a pre-assembled, knocked-down version with servos installed. Ambitious giant-scale heli modelers should like this machine. Contact Flite Craft Model Co., 1595 Victoria St. N., Unit 7, Kitchener, Ontario, Canada N2B 3E6; (519) 742-7141; fax (519) 749-1315.

## 104! THE MANNED MISSILE



The Lockheed F104—much loved, much feared. Nicknamed "the missile with the man in it," or something like that, it was probably the smallest airframe ever wrapped around the General Electric J79 engine. I.T.P. of Carlsbad, CA, now imports this Italian 1/9-scale kit of the famed Starfighter. This highly prefabricated kit features pre-glassed wings that are not scale; they incorporate a thickened airfoil for much improved slow-flight characteristics. Flaps and leading-edge slats are not needed. The 42-inch-span, 80-inch-long model was designed for the German Gleitschiff pusher fan, but according to I.T.P., a Byron unit will fit easily with very little modification, probably because the two units have similar dimensions. Contact I.T.P., 5621 Palmer Way, Ste. E., Carlsbad, CA 92008; (619) 431-7131; fax (619) 431-7135.

# AIR SCOOP



## KNOCKOUTS

Obviously, the beautiful Julie Soriano, *Model Airplane News* editorial assistant, has to knock the guys away from her with a baseball bat. Anabatic Aircraft's Anabat, however, is a different type of "knockout" model. According to the manufacturer, these computer-designed, slope-soaring combat planes are so strong that they can actually knock each other out of the sky and sustain no damage. Building time is typically 4 to 8 hours. The \$59.95 price for two complete kits (it takes two to tangle) includes the covering material. Build a pair with a friend...or an enemy! Julie is holding the aerobatic Anabat. Contact Anabatic Aircraft, 8 Gypsy Hill Rd., Pacifica, CA 94044; (415) 359-8588; fax (415) 359-9767.

## U.S. AIRCORE'S KNIGHTHAWK

U.S. AirCore calls the new KnightHawk an All-Weather, Sport/Utility, Multi-Mission airplane (AWSUMM™). Designed for 4- to 6-channel radios, the KnightHawk is sure to appeal to the beginner and the experienced R/C researcher alike. Shown below is the Aerial-photo Recon Module™, which fits inside the KnightHawk's pod and is designed to hold either disposable cameras or motorized units such as the Vivitar PS44. The floating mount ensures clear photos even at full throttle, according to AirCore.



## Showtime in Chicago

The rest of this month's Air Scoop focuses on the RCHTA (Radio Control Hobby Trade Association) Show, which is held every year in the Windy City, just around Halloween. Here are some of the tricked-out-treats I came across.

## JR 10S AIRCRAFT SYSTEM



To refine and improve its proven PCM-10 system, JR has introduced a fast, smooth, more precise top-of-the-line computer radio—the 10S. According to the manufacturer, an independent study relates that response time has been cut in half, which makes it the fastest radio in the industry. JR states that the programming is the most sophisticated available; it has many control options, yet the functions are easy to access, understand and use.



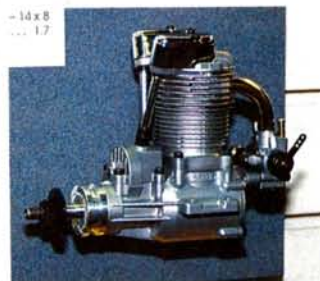
## TEAM ZAP

The Zap-Gang Air-Show Team is sponsored by Robart, Lanier and Pacer Technology. These four Lanier Stingers, which were on display at the entrance of the static show-room at the Chicago show, are powered by Zenoah G-62s, equipped with SlimLine smoke systems and completely held together with Zap CA. These super performing models are subjected to serious, high-G stresses during their routines.



## ACE R/C

You can always find something new and a little different at the booth of those prolific and diverse model producers from Ace R/C. Top: Ace President Tom Rungee is holding the new 05 electric-powered PuddleMaster. The 44-ounce design requires six to seven cells and has a 48-inch span with 402 square inches of wing area. Yes, the model does take off from water with no problem. Bottom: Ace's new, very-high-quality Pro Panel power panel handles multiple-cylinder engines. Standard version (one to two plugs) and Heavy Duty version (one to five plugs).



## SAITO .91

Saito, makers of 4-strokes exclusively, displayed this prototype .91, which is reported to be the same weight as their ever-popular, powerful .80. Although the .91 has the same crankcase casting as the .80, its external appearance will be slightly different than what you see here.

# AIR SCOOP



## THE SILENT SCREAM of a VIPER

I was very impressed with the design of this new Davey Systems .40- to .60-size Viper. Ted Davey has really gone the extra mile with the lightweight, fully symmetrical, multi-turbulated wing design. I'm sure this wing will give the Viper smooth, highly aerobatic performance while still retaining a wide flight envelope. Because it's so light, the Viper makes an excellent electric-powered "silent-screamer" with a high-quality .40-size engine. The 60-inch-span Viper has 620 square inches of wing area and can be powered by a .40 to .60 2-stroke, a .48 to .60 4-stroke, or an Astro Flight, Webra, Ultra Keller or Plettenburg .40-size engine. For more information about this unique, all-wood design, contact Davey Systems Corp., 675 Tower Ln., West Chester, PA 19380; (215) 430-8645.



## VALIANT GETS ITS ARMOR

Chief designer Mr. Song has spent the year fine-tuning this innovative, 8-function, 50-synthesized-channel Valiant radio from Polk/AristoCraft. The radio won't allow flight on a particular frequency if interference is detected. Mr. Song also gave Valiant a coat of chrome armor that not only reflects solar heat, but also guards against static intrusion. Stay tuned for a closer look at this one in the pages of *Model Airplane News* soon.

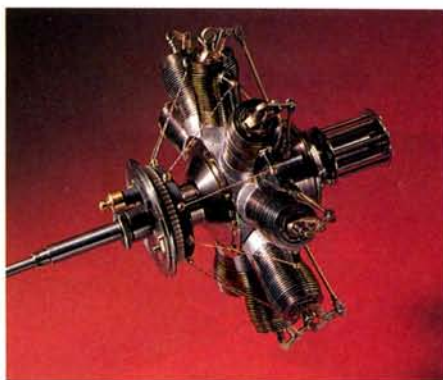
## PERSONALIZED PERFORMANCE

The new Futaba 9-channel PCM1024Z aircraft radio features frequency synthesizing, F3A/F3B/F3C software, 10-model memory, Flight Planner pre-sets (5), data transfer, auto power-off, digital electronic trim, a tachometer, call-waiting and tons of other stuff. The Heli version has the same features, but with programmable idle-up (3), gang mixing, U-shaped throttle, pitch mixing, CCPM mixing (5) and much, much more.



## THE GNOME IN COLOR

In the December '92 issue, I was only able to show you a black-and-white picture of Replica Engines' amazing 1/4-scale Gnome rotary engine. I thought this operational-scale work of art was worth one more look—this time, in color! For those of you who missed my December Scoop—I can't imagine such a thing—this replica of a 1913, 9-cylinder, single-valve, French rotary engine has exact-scale operation. Displace-



ment is 3.97ci. For more information, contact Replica Engines, 16640 S. 104th St., Orland Park, IL 60462; (708) 403-5127; fax (708) 403-5625.



## FLY WITH FINESSE™

Carl Goldberg Models brings you the Finesse, designed by world-class pattern flier Dave Patrick. This CAD-perfected design will be offered in three sizes and in various stages of prefabrication and finish. The Finesse 120 (available this winter) has a 72.5-inch wingspan with 1,024 square inches of area; the Finesse 60 and Finesse 40 (available Spring '93) have 850 and 600 square inches of area, respectively. Carl Goldberg Models and Dave claim the Finesse is "everything you need to start collecting trophies."

## ULTIMATE-MIXTURE-CONTROL

The new O.S. .61 SX-H (side exhaust) and .61 RX-H (rear exhaust) heli engines have a unique three-needle carburetor system that's specifically designed for easy, accurate fuel-mixture adjustments in the mid- and upper-mid rpm ranges that are so important in precision helicopter flying. This engine is designed to provide extremely smooth running throughout all modes of flight, especially in hover and transition to hover from forward flight. Designed to run with pipe or muffler.



# AIR SCOOP

## SUKHOI ARF Balsa!



MPI/Cermak introduced this .60-size Sukhoi that's beautifully built of lightweight balsa; there's no foam or plastic in the construction. The model is available in an ARC version (almost ready to cover—shown here held by Jarvis and Tracy Yeh) or in ARF versions finished in silver or white Ultracote. Both versions are supplied with a fiberglass cowl, a fiberglass belly pan, spring-aluminum landing gear and hardware. Specs: span—57 inches; wing area—627 square inches; power req'd—.60 to .90 2-stroke or .90 to 1.20 4-stroke; weight—7.5 to 8.5 pounds. Contact MPI/Cermak Electronics & Model Supply, 551 Mulberry Ct., Buffalo Grove, IL 60089; (708) 808-0145; fax (708) 808-0146.

## HI-TECH PRISM

If you're one of those people who are daunted by computers—I know I am—and you feel that many modern computer radios are too complicated to mess with, the Hi-Tech Prism might be the answer to your problem. According to Chun Park, owner of Hi-Tech, this 3-model-memory radio is designed so that you won't get lost in its simple programming. This unit won't be avail-



able until early spring; we'll be able to tell you more then.

## HOBBYLAB'S F-14 ROCKET GLIDER



The SFA (Sports Flyers Association) has started a safety engineering, products research and development lab for manufacturers, and this new Hobbylab F-14 is an example of their design work. The swing-wing F-14 incorporates numerous safety features, and it's for the beginning flier/builder. This Hobbylab F-14 soars from 600 to 1,000 feet using commercial solid rocket engines, swings its wings forward and glides back to earth guided by a 2-channel radio. For more information, contact SFA, 4145 Travis, Ste. 202, Dallas, TX 75204; (800) 745-3597.

Look to Jet Hangar Hobbies for twice as much airplane for your dollar. The JHH F-86F special package includes a complete kit, K&B 7.5 cc engine, tuned pipe, Turbax™ I Fan, Rhom Air Retracts and hardware, all for only \$785.00\* - half that of the other leading manufacturer's F-86. Not only is it easy to afford, but it's also very easy to build and fly. The F-86F was designed as a true ducted fan trainer, possessing excellent high and low speed flight characteristics. It's hard to stall and easy to land. This kit can be built as a Navy FJ-2/3 Fury or an Air Force F-86F Sabre.

So if you're doing a little too much spending and not enough flying, or if you've wanted to move up to a ducted fan but thought it was too expensive, then the Jet Hangar Hobbies F-86F special package is the airplane for you!

\*Includes UPS ground, California residents add sales tax.

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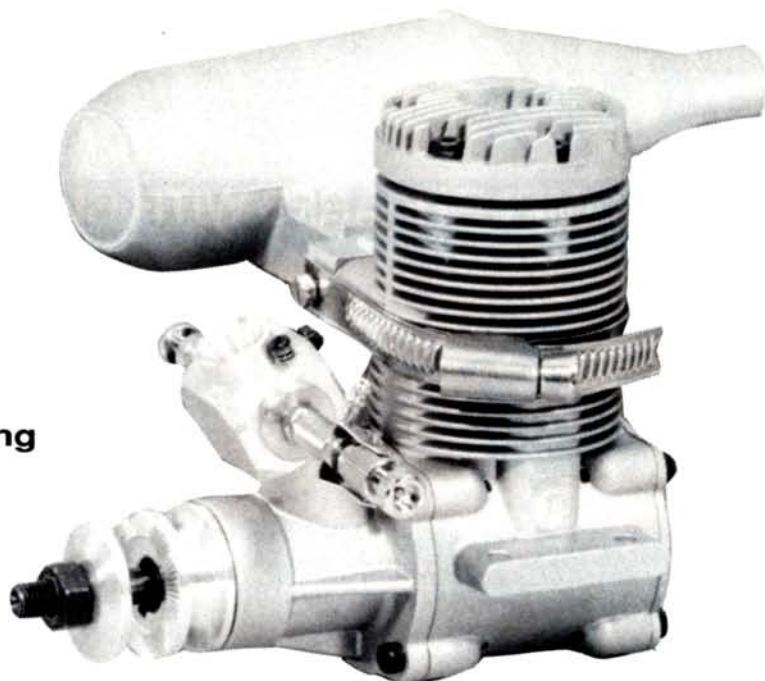
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by DAVID GIERKE

## ENGINE REVIEW

# Real Performance Measurement

Featuring  
In-Flight Testing



**T**HIS MONTH'S "Real Performance Measurement" contained some real surprises for me—not so much from our Webra\* .70 test engine, but from the testing procedure itself! Read on....

When the Webra arrived, I was pleased because I already had been flying a Webra speed .60 for the past 10 years in an old (23 years old!) Kraft Kwik-Fli. The .60 always performed well, but it would be fun to see how much of a performance increase could be expected from the .70.

Why a .70? Although the Webra .70 can't be used in pattern competitions (.61 ci for 2-stroke engines is the limit), there appears to be a clear need for this engine in overweight, higher-drag pattern and/or sport airplanes like my Kwik-Fli, which will never see another competition (thank goodness!). Scale competitors also might benefit from a slightly larger displacement engine. The .70 appears to have been generated from Webra's recently developed and highly successful helicopter engine. Whatever the reasons, the engine was here, and I was anxious to begin testing!

Upon opening the box, I was greeted by Webra's traditional highly finned crankcase. There's no mistaking this engine for anything but a Webra! The carburetor was of the TN rotating-barrel variety, as opposed to the popular, more expensive Dynamix throttle-slide unit. The TN carb has both a high-speed and a low-speed needle valve, and they greatly simplify making adjustments for idling and mid-range performance.

Webra engines are always well machined and pleasing in appearance. This engine has a

gray matte finish, probably caused by the bead blasting process. All fasteners are of the Allen-head variety—metric. The crankshaft is a rather small 1/4-inch diameter at the prop-nut thread.

Since the next step is to disassemble the engine for inspection and cleaning, a caution and a few pointers are in order.

1. For review purposes, I always disassemble the engine, at least partially. If you have never disassembled one of these little gems, I would suggest that you don't start now! Without the knowledge and tools, you might severely damage your new engine. Run it as it comes from the manufacturer! Chances are, it will perform admirably!

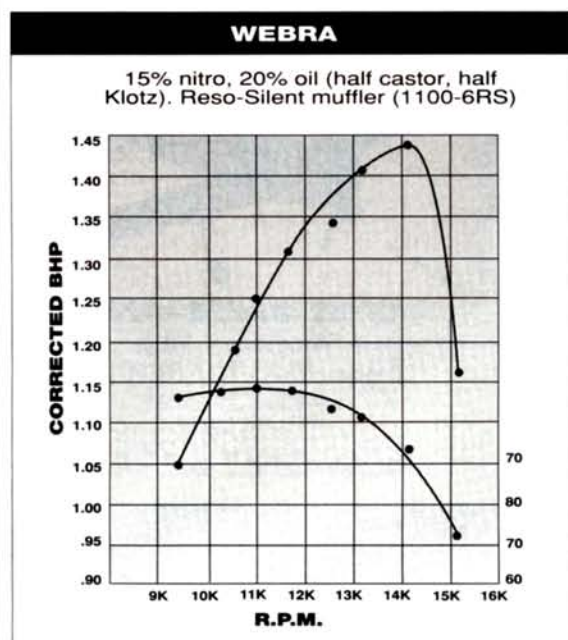
2. If you insist on breaking the engine down to

its basics, find someone in your club or the local "expert" at the flying field who is willing to guide you. But remember, Webra states in its instructions that "The engine should be dismantled only when absolutely necessary."! (Such as, after the engine buries itself in the mud, after a crash...)

3. It's absolutely essential that the parts go back together the way they came apart! Now, this seems obvious, and there aren't that many parts in the first place, right? Well, I wish I had a dollar for every used engine I've seen with the piston or the cylinder (or both) installed backwards. (Don't laugh. If there's a 50/50 chance to get it wrong, which way do you think it will go?) To avoid all these problems, you

must scribe a small identification mark on the critical pieces. These include the rear of the connecting rod (as viewed from the backplate end of the engine). If the wristpin is to be removed from the piston/rod assembly, scribe another small mark on the rear wristpin "land," inside the piston. The cylinder head can be marked similarly to make certain you know front from rear.

The Webra's backplate, head, piston/rod sub-assembly and cylinder were removed along with the crankshaft-front case sub-assembly. The engine consists of twin ball bearings supporting the crankshaft; ABCD (aluminum piston with brass chromed cylinder and Dykes ring) piston and cylinder construction was used. The Dykes ring is located at the top of the piston (as it is on the ever popular K&B\* .40), and it doesn't



## FLIGHT TEST:

Engine: Webra .70  
Airplane: AirTrax 60  
Fuel: 15% Red Max (20% oil—half castor, half Klotz)

| Prop Mfg. & Size           | Ground RPM | Air RPM |          | True Airspeed MPH |           | db at 9 Feet | Relative Air Density (%) | Wet Bulb | Dry Bulb | Bar       |
|----------------------------|------------|---------|----------|-------------------|-----------|--------------|--------------------------|----------|----------|-----------|
|                            |            | Loop    | Straight | Loop              | Straight  |              |                          |          |          |           |
| APC 11-7 C-2               | 13,000     | 13,000  | 14,250   | 59 MPH            | 104 MPH   |              | 97.5%                    | 63°F     | 68°F     | 29.89" Hg |
| GRAUPNER NYLON 11-7        | 12,000     | 13,000  | 14,550   | 56 MPH            | 105.5 MPH | 99db         | 97.5%                    | 63°F     | 68°F     | 29.89" Hg |
| REV-UP PRO SERIES 4 11-8   | 12,250     | 12,250  | 13,500   | 56 MPH            | 102.5 MPH |              | 97.5%                    | 63°F     | 68°F     | 29.89" Hg |
| APC 11-8 C-2               | 12,550     | 11,750  | 13,000   | 55 MPH            | 102 MPH   |              | 97.5%                    | 63°F     | 68°F     | 29.89" Hg |
| TOP FLITE POWER POINT 11-7 | 12,750     | 12,550  | 13,500   | 54 MPH            | 102.5 MPH |              | 97.5%                    | 63°F     | 68°F     | 29.89" Hg |
| ZINGER 11-7                | 12,500     | 12,000  | 13,200   | 53 MPH            | 99 MPH    |              | 97.5%                    | 63°F     | 68°F     | 29.89" Hg |

Notes: the Top Flite prop vibrated excessively, even after balancing. A check of the pitch at various blade station points showed no deviation from one blade to the other. The only difference between this prop and the other wooden units tested: the TF prop flexes more from hub to tip.

rotate because of the small pin that's pressed radially into the crown of the piston at the ring gap. This prevents the ends of the ring from "hooking" a cylinder port as the piston reciprocates in the cylinder. The pin is strategically positioned on a part of the cylinder that isn't interrupted by a port. Speaking of ports: the Webra incorporates the Schnuerle with the boost transfer port system that's so popular with modern high-performance engines.

As far as machining and workmanship are concerned, no metal "flash" was detected on any of the cylinder ports or the piston. No dirt or metal chips were found inside the engine. Paper-thin gaskets on the backplate and the front crankcase were carefully removed (I use an X-Acto knife to lift them off) to proceed with ultrasonic cleaning. I have two ultrasonic cleaners. One holds a quart of fluid and the other holds about a pint. The cleaning action is produced by high-frequency vibrations that literally shake the dirt and metal particles off the parts. I put major components into the tank with some liquid detergent (one part Formula 409 to four parts water) and vibrate them for 10 minutes. Immediately after I've removed the parts from the tank, I rinse them in warm tap water. Next, I blow them dry with my air compressor, and finally, I spray them thoroughly with WD-40. Now the engine can be reassembled.

## BREAK-IN PROCEDURE

The engine was mounted securely to my new, all-aluminum bar stock Pro model engine test stand (6061-T6) from Sheldon Engineering\*. The stand resembles the old E-Z-Just unit that was manufactured for years out of hard maple.



Airtrax with telemetering "pod" mounted on fuselage. Notice the air-speed sensor mounted on left wing. The rpm sensor is mounted directly behind the prop on the engine's beam mount.

However, the Pro is much sturdier and can easily handle any engine from .049ci to 1.8ci. There's even a provision for a shock-mounted 12-ounce fuel tank. Best test stand I've ever seen!

Webra recommends 15-percent-nitro fuel, so I decided to use my trusty Red Max\* fuel with 20 percent oil (half Klotz/half castor oil). All engine tests and flying were performed with Webra's long chamber Reso-Silent muffler (no. 1100-6RS). At the conclusion of the dynamometer tests, however, I spot-checked their other two mufflers for brake horsepower and decibels (no. 1100-6G and no. 1100-6E-G).

For a break-in propeller, I used a Zinger\* 12x6 cut down to 10 1/2x6. This would allow the engine to operate in a fast 4-cycling mode at about 13,000rpm.

The engine was run a total of 60 minutes. The first 20 minutes were run in a fast 4-cycling mode, at 2-minute intervals, allowing the engine to cool thoroughly between runs. The next 21 minutes were run for 3-minute intervals, again allowing for cooling. The last minute of each run was used to needle the engine to a rich 2-stroke for about 20 seconds or so before richening. The last 19 minutes were spent operating the engine for 2 minutes and then 3 minutes at a time, progressively leaning the engine toward peak rpm. As the engine's temperature rose, the needle was backed off to a rich 4-stroke and allowed to cool before leaning again.

period required more than 4 hours of time to complete, so I decided to proceed to dynamometer testing, knowing the limitations would gradually be overcome with further running. It

This engine requires a lot of break-in! After the hour's running, it still wouldn't hold a consistent peak rpm setting for more than about 15 seconds. Upon inspection of the piston ring through the exhaust port with the muffler removed, I observed that the ring still had black plating showing and was just beginning to show a gray band at its top. (After about 2 1/2 hours of running time, the engine has a totally gray piston ring with great compression!)

The one-hour break-in

## DYNAMOMETER TEST

Engine: Webra .70  
Fuel: 15% Red Max (20% oil—half castor, half Klotz)

|      | RPM   | TORQUE<br>OZ-IN | BHP  | CORR.<br>FACT. | CORR.<br>BHP | WET<br>BULB °F | DRY<br>BULB °F | BAROMETER<br>IN. OF HG. |
|------|-------|-----------------|------|----------------|--------------|----------------|----------------|-------------------------|
| 1.00 | 15.1K | 73.8            | 1.11 | 1.05           | 1.17         | 65°            | 71°            | 29.32                   |
| 2.00 | 14.1K | 97.2            | 1.36 | 1.05           | 1.43         | 65°            | 71°            | 29.32                   |
|      | 13.2K | 102.0           | 1.34 | 1.05           | 1.41         | 65°            | 71°            | 29.32                   |
| 3.00 | 12.5K | 103.3           | 1.28 | 1.05           | 1.34         | 65°            | 71°            | 29.32                   |
| 4.00 | 11.7K | 108.0           | 1.25 | 1.05           | 1.31         | 65°            | 71°            | 29.32                   |
| 5.00 | 11.0K | 108.6           | 1.19 | 1.05           | 1.25         | 65°            | 71°            | 29.32                   |
| 6.00 | 10.5K | 108.0           | 1.13 | 1.05           | 1.19         | 65°            | 71°            | 29.32                   |
| 7.00 | 9.4K  | 107.1           | 1.00 | 1.05           | 1.05         | 65°            | 71°            | 29.32                   |
| 8.00 |       |                 |      |                |              |                |                |                         |

Notes: fuel consumption—19 seconds/10cc (1.07 oz./min.) at peak b.h.p.  
20.2 seconds/10cc (1 oz./min.) at peak torque

should be mentioned that the heat range for the original Fox\* glow plug was too cold. This was determined when the glow plug heat was removed after initial starting. The engine would immediately richen and lose several hundred rpm. The Fox plug was replaced by a K&B 1L plug of higher heat range, and that solved the problem.

The .70 was operated with a range of propellers offering a variety of loads, specially trimmed and balanced to allow the engine to operate at roughly 1,000rpm intervals at full throttle on the dyno. As an example, the heaviest load prop was an old-style Top Flite\* 14x6 Super M, which ran at about 9,400rpm. The lightest load prop was a Top Flite 10x6 Super M, cut to a 9-inch diameter, which ran at about 15,000rpm.



Setting the needle during break-in period, using a tachometer. Decibel readings were taken at 9 feet.

All the dyno tests ran smoothly until the last and highest rpm level. At this point, a violent vibration in the torque arm shook all of the dash pot oil out of the vibration damper reservoir—and all over me, its faithful operator! After explaining to my wife, Carolyn, what had happened to my clothes, I solved the problem by changing to a higher viscosity oil (#50), and, ultimately, reinforcing the torque arm!

## DYNAMOMETER RESULTS

The engine had a peak brake horsepower (b.hp) of 1.43 at 14,100rpm. Peak torque occurred at 11,000rpm and registered 108.6 ounce/inches. Although the torque figure isn't all that high, the torque curve is very flat, holding up well until the "critical point" at about 14,000rpm, where the torque declines faster than the rpm increase. Thus, the b.hp drops from its maximum. As we shall see with the flight-testing, this torque curve allows a variety of propellers to be used successfully.

Fuel-consumption tests were performed at both the peak torque and peak b.hp rpm. Results were just about 1 fluid ounce per minute at 11,000rpm and 1.07 fluid ounces per minute at 14,100rpm. It must be emphasized that these figures represent absolutely peaked rpm, on the verge of going lean, as dyno tests must be performed. In actual flight testing where the engine is sensibly operated slightly rich, fuel consumption can dramatically increase to upward of 1.75 fluid ounces per minute!

After the carburetor had been adjusted carefully using a potential flying prop (Rev-Up\* Pro-series 11x8), the engine registered a nice 2,800rpm idle that would smoothly transition to 12,500rpm after 1 minute at the idle point. I was impressed!

For comparison purposes only, I checked the

noise level for each of the three previously mentioned mufflers while the engine was still on the dyno. Here are the results:

- long (1100-6RS): 98dB at 9 feet
- intermediate (1100-6E-G): 100.5dB at 9 feet
- short (1100-6G): 103dB at 9 feet

The dyno indicated that there was about a 2 percent b.hp increase with the intermediate silencer and a 5 percent b.hp increase with the short job—almost double the noise from long to short!

## FLIGHT TESTING

Flight-testing started out with a bang! Tom Atwood, *Model Airplane News* editor, suggested that we use L&R's\* Airtrax 60 for our test vehicle. After obtaining one of these beauties from Rob Roy of L&R, I installed the radio controls and tank and modified the nose (cut it off) allowing me to mount a variety of engines easily. Since I had heard several rave reviews about the ship, I wasn't surprised to find that it indeed flew very nicely. After the initial trim flights with the Airtrax, I took it home to make some minor changes (add wheel pants and apply decals) before actual telemetered data retrieval with various flight props on our Webra .70. When the rain, wind and otherwise terrible weather subsided two weeks later, Frank Vassallo and I went to the local flying field for some testing.

Everything started well. The radio range checked, the tank filled properly, the starter worked, and...the engine started! It idled beautifully to 2,800rpm as indicated by the telemetering unit. The control surfaces moved and I taxied out for takeoff...nothing left to do but fly!

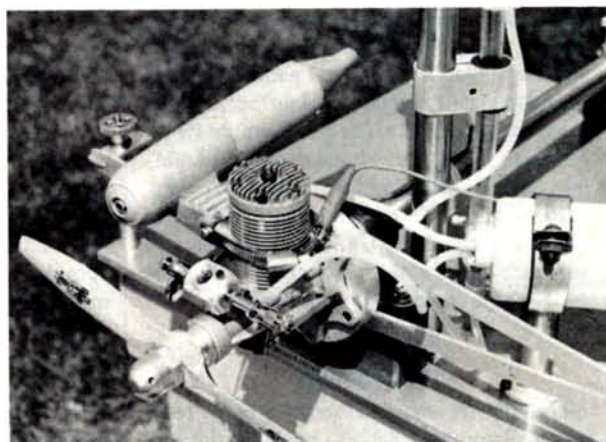
Advance the throttle, start to roll out, hold a touch of up-elevator to keep from nosing-over on the grass field. Add a touch of right rudder to keep it going straight. The Airtrax is really moving now, about 100 feet down the runway. Pull up-elevator, and there she goes! A beautiful take-off! The ship is banking ever so slightly to the left. No problem, apply a bit of right aileron—what?! It's rolling *faster* to the left?! Apply full right! You guessed it; it rolled faster to the left! Even before it plowed into the (thankfully) soggy ground nose-first, it flashed through my mind: the ailerons are reversed! (Of course, all this happened in about 2 1/2 seconds. Not enough time to take corrective action, like somehow get the wings level and fly it down using the rudder!)

There was nothing left to do but survey the damage. Surprisingly, after having its nose knocked off, the rest of the ship was in pretty

good shape. The servo rails had been sheared off the fuselage sides, but the rest looked OK. In retrospect, Rob Roy had told me this was "one tough bird." Now I believe him! But what happened to the ailerons? Then it hit me! I used the same transmitter for another airplane on which I had just installed the airborne equipment, and I had to reverse the servo throw. I forgot to reset the switch on the transmitter, and the rest is history. How stupid! In 24 years of flying R/C, I had never had this happen, but as they say, "If everything went right all the time, you'd get bored." I'll take boredom.

The question was: "What do I do now?" When I first pulled our test engine out of the mud, I couldn't even see most of it. First impressions are always, "This thing is junk. I'll have to build something new." However, when you get everything home and cool off a bit, things don't look quite as bleak. The engine required about 3 hours of work to bring it back to condition, no worse for wear, other than a broken needle-valve body. (Perhaps a future column might be in order, describing and demonstrating the way to restore a severely crashed engine.)

To make a long story short, I had the Airtrax 60 with the Webra .70 ready to fly (minus the



Webra radially mounted on dyno, after break-in.

needle-valve body) a day-and-a-half later (amazing what one can do when one's mad and embarrassed). Actually, I think that the model looks even better now that I've "enhanced" the fuselage trim scheme.

Obtaining a new needle-valve body was as simple as calling Hobby Dynamics\* (a division of Horizon Hobby Distributors Inc.), which promptly supplied me with what I needed (thanks to Chris Mikovsky!).

The flight tests that followed confirmed that the Airtrax was none the worse for wear. Absolutely no trim input was required, and it flew really well. Need I say that I checked the direction of all controls before takeoff this time?

The flight-testing of the Webra went very smoothly. Besides having a wheel pant loosen

and a glow plug burn, the testing of six props over 4 1/2 hours, using 3/4 gallon of fuel, was a breeze. The testing consisted of starting and needling the engine to maximum flying rpm (slightly on the rich side), and recording that rpm as read through the telemetering system. The model was then flown around the field straight and level where rpm and air speed were recorded.



Rich setting during early stages of break-in.

I then began a series of inside loops (one per lap of the field), about 200 feet in diameter, where the minimum air speed and rpm were recorded. A minimum of four passes were performed for each rpm and air speed. These were later averaged, before analysis. I must comment that the telemetering system performed without a hitch, sending a steady stream of data to the ground, where Frank recorded it all.

The Graupner\* nylon 11x7 was felt to be the best from a strictly subjective point of view. It ran very smoothly, required a relatively short takeoff run (about 75 feet) in 2 1/2-inch-high grass and pulled crisply through loops. If you look at the b.hp curve and the data for this prop, you will see the following:

1. On the straight and level, the prop allows the engine to rev slightly beyond the peak b.hp point, but the air speed is the highest of all props tested.
2. Through loops, the Graupner loads down to about 13,000rpm, but because of the flat torque curve, is still operating within the top 2 percent of torque. This translates into a good 56mph at the slowest point during the loop.

The APC\* 11x7 C-2 prop functioned well, but required a longer takeoff run through the grass to get airborne. The data reveals that it ran very near the b.hp peak during the straight and level and pulled through the loops at a test-session high of 59mph. As you might imagine, the ground thrust was not quite as good as the Graupner's, because of its smaller area.

The best wooden propeller, in my estimation, was the Rev-Up Pro series 11x8. It displayed good airspeed through the loops (56mph) while falling slightly behind on the straight-away speed (102.5mph). This is probably because the prop wouldn't quite allow the engine to attain its maximum b.hp speed (13,500rpm).

The APC 11x8 C-2 seems to have too much pitch for the Webra, as the straightaway speed and air speed through the loops were less than those with the APC 11x7.

These four props were exceptional with our Airtrax 60 and Webra .70. The Webra engine, with its flat torque curve, allows for such diverse props to be successful. In the final analysis, it's up to the pilot to determine the propeller to be used!

## HITS

I really liked the overall construction of the Webra, including its sturdy reciprocating components. Its fine idling characteristics make the engine a joy to operate, especially during prolonged landing pattern periods at full idle.

## MISSES

Instructions and advertising sheets. Unless you read German, the advertising sheet won't be of any help in identifying your favorite engines (30 of them are illustrated). The instructions were tough for me to figure out, so there's room for improvement, for sure! For example: there's a reference to a carburetor diagram that isn't included. The TN carburetor has instructions, but says, "Using a jewelers' screwdriver, carefully screw the low-speed needle in as far as it will go." In reality, this engine doesn't have this setup. It uses an actual needle valve for setting the idle and intermediate throttle mixture.

A parts list would be a welcome addition to the paperwork included with the engine. Being able to simply include a part number when ordering replacements would eliminate miscommunications.

One minor inconvenience that cropped up concerned the wrong strap screws that were included with the no. 1100-6G muffler.

## CONCLUSIONS

I had fun running the Webra .70 and believe that it's a welcome addition to the sport series of engines currently available to modelers at reasonable prices. Just remember to check the directions of your ailerons!

\*Here are the addresses of the companies mentioned in this article:

**Webra:** distributed by Hobby Dynamics Distributors, 4105 Fieldstone Rd., Champaign, IL 61821.

**K&B Mfg. Inc.,** 2100 College Dr., Lake Havasu City, AZ 86403.

**Sheldon Engineering Co.,** 295 Jay St., Birchwood, MN 55110.

**Red Max Fuel/FHS Supply Inc.,** P.O. Box 9, 239 Bethel Church Rd., Clover, SC 29710.

**Zinger:** distributed by J&Z Products, 25029 S. Vermont Ave., Harbor City, CA 90710.

**Fox Mfg.,** 5305 Towson, Fort Smith, AR 72901.

**Top Flite/Great Planes Model Distributors,** P.O. Box 9021, Champaign, IL 61826.

**Rev-Up:** distributed by Progress Mfg. Co., P.O. Box 1306, Manhattan, KS 66502.

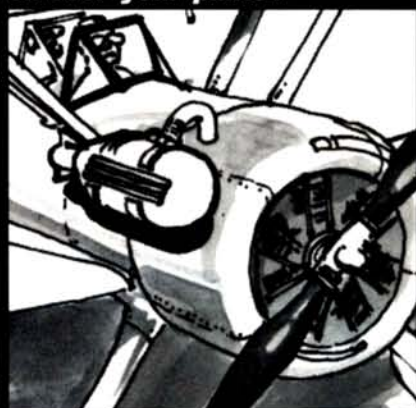
**L&R Aircraft Ltd.,** 13645 Fisher Rd., Burton, OH 44021.

**Hobby Dynamics Distributors,** see above.

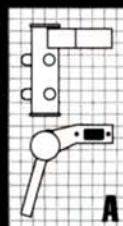
**Graupner:** distributed by Hobby Lobby Int'l., 5614 Franklin Pike Cir., Brentwood, TN 37027.

**APC Landing Products,** P.O. Box 938, Knights Landing, CA 95645.

**Do you put your underwear on over your pants?**

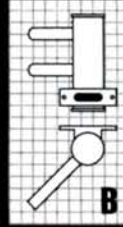


**Then why leave your muffler outside the cowl!**

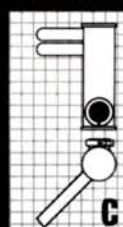


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Wingspan 42" / Length 63"  
Weight 10.5 lbs

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# HOW TO



1. The aluminum finish on the Unitaar has been enhanced by the addition of panel lines and rivets.

by FAYE STILLEY

## RIVETS AND GRAPHICS



2. The panel lines and rivets are press-transfer graphics. Covered with clear film, they're completely fuelproof.



3. Letraset offers many graphics; I use 1-point lines for panel lines. They come on sheets and are available in many widths.



4. These lines have been applied to the adhesive side of clear film that has then been cut into strips. They're now ready to be ironed onto the model.

**W**HEN I HAD finished covering my first airplane with aluminum-colored film, I realized how dull aluminum looks without trim. The film was supposed to look as if it had a metal finish, but without rivets and panel lines, etc., it just looked sort of gray.

### A simple technique to increase scale realism

At first, drawing panel lines, rivets, access doors, etc., seemed like the easy solution. The questions of what to draw with, how to space and draw rivets, and how to seal all this against fuel were enough to make me seek out a better way.

As you see in photos 1 and 2, nicely spaced rivets and panel lines are possible. The answer to the fuelproofing problem is

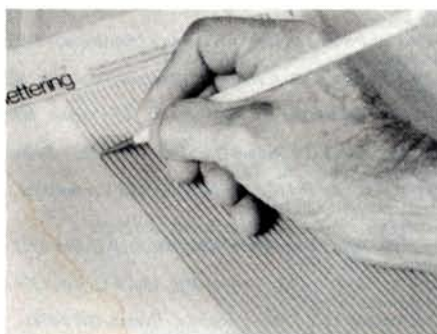
simple: cover the graphics with a clear covering film. When sealed down, it provides permanent, fuelproof protection and is virtually invisible.

### PRESS-TRANSFER GRAPHICS

As for the panel lines, rivets and other graphics, the "press-transfer" materials found in art-supply stores work perfectly. The lines come in sheets in various widths. I used 1-point line rules made by Letraset (photo 3).

By rubbing the lines onto the adhesive side of the clear film and then cutting the film into strips, you can make all the straight panel lines you need (photo 4). Rub the image onto the covering material with a stylus or an ordinary ballpoint pen. By rubbing the graphics onto the clear film instead of onto the covered aircraft, you'll avoid damaging the aircraft's surface. You must rub fairly hard to transfer the image (photo 5).

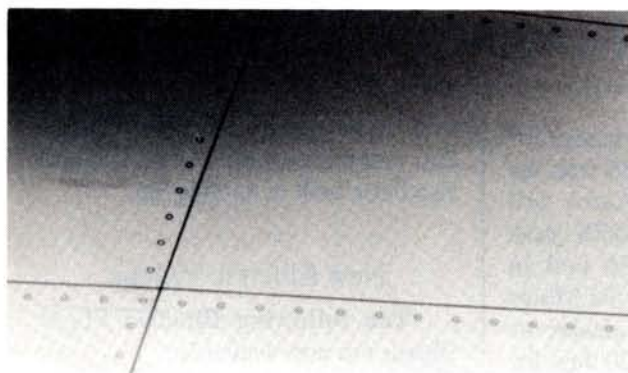
For the "rivets," I use Chartpak RDC 1,



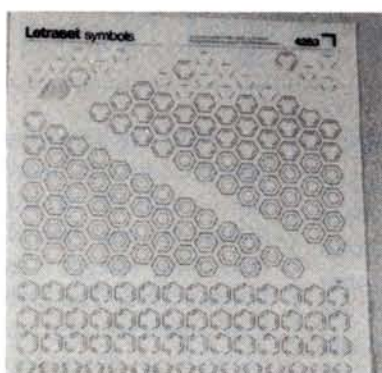
5. By rubbing the graphics onto the film instead of applying them directly to a finished model, you'll avoid denting the model's surface. A fair amount of pressure is required to transfer the image.



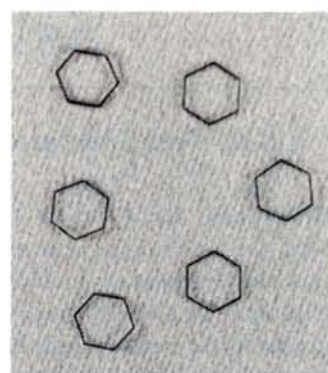
6. Applying straight lines of evenly spaced rivets is a breeze if you use Chartpak RDC 1, which comes in a roll.



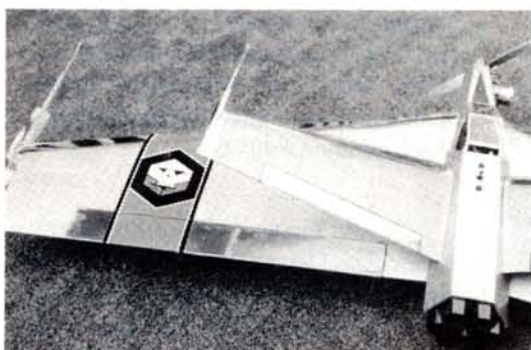
8. Once in place, the clear film is virtually invisible.



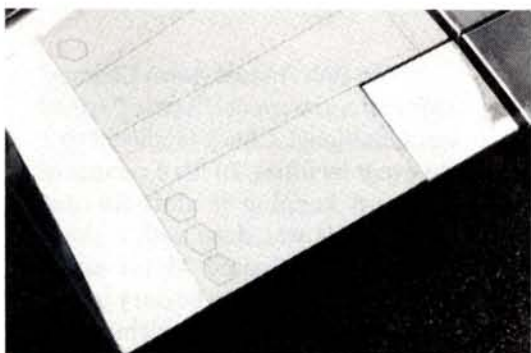
9. The many available symbols can be used in the same way as the panel lines and rivets.



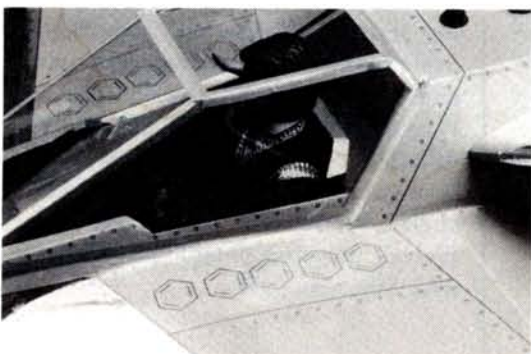
10. Applied to the adhesive side of clear film and cut out, these markings are ready to be applied.



11. The fuselage cross section is hexagonal, so hexagonal symbols seemed in order.



12. Hexagonal access panels along the wingtip add detail to an otherwise plain finish.



13. These hexagons with bars make very convincing step plates along the side of the cockpit.

which comes in a roll, like tape. The little circles (rivets) are equally spaced and in a straight line, so there's no problem with spacing and alignment (photo 6).

Some panel lines look better with a row of rivets running alongside. This is easy to do, too. Just put a line and a row of rivets together on the adhesive side of the film, and cut the film into strips (photo

**"Press-transfer graphics provide unlimited possibilities for creating an aircraft that looks unique."**

7). On the airplane, the clear film is almost invisible; you see what looks like a panel secured with rivets (photo 8). Two rows of rivets might also be appropriate; apply them in the same way.

## OTHER SHAPES

If you search through the "symbol" catalogues that are provided by the makers of the press-transfer materials, you'll find a wide variety of shapes. I found some hexagonal symbols (photo 9), which are perfect for certain details. They were rubbed onto the adhesive side of the film and then cut out (photo 10). I used a "hexagon" theme throughout my Unitair design. The airplane fuselage is hexagonal, as is the insignia on the wing (photo 11). Photo 12 shows hexagonal symbols that simulate access doors near the wingtips. Hexagons with

bars inside them simulate the step plates near the cockpit (photo 13).

You'll find circles, diamonds, stars, squares, ellipses and myriad other shapes in a variety of sizes and colors. Even reverse lettering is available.

## TEST THE GRAPHICS FIRST

At first, I thought that the graphics might melt under the film when I applied heat. To



7. Making a panel line with a row of rivets alongside is also easy. Apply both details to the adhesive side of clear film, cut the film into strips and stick the strips onto the model.

my surprise, I had no problem, but it's probably worth testing them on scrap. Many manufacturers make press-transfer materials, and I'm only familiar with those I mention.

If the base covering sticks to the underlying wood as you put on the trim, you can pull it back off. Just put a "high-tack" tape, like packing tape, alongside the trim strip, and pull the base covering off the wood by pulling on the packing tape. Sometimes, it takes more than one attempt to loosen the covering.

Press-transfer graphics provide unlimited possibilities for creating an aircraft that looks unique. ■

# PILOT PROJECTS

## A LOOK AT WHAT OUR READERS ARE DOING

### SEND IN YOUR SNAPSHOTS

Model Airplane News is your magazine and, as always, we encourage your participation. In "Pilot Projects," we feature pictures from you—our readers. Both slides and color prints are acceptable.

All the photos used in this section will be eligible for a grand prize of \$500, which will be awarded at the end of 1993. The winner will be chosen from all the entries published, so send us a photo or two and a brief description of your creation!

Send those pictures to Pilot Projects, Model Airplane News, 251 Danbury Rd., Wilton, CT 06897.



#### DON'S ULTIMATE

Don Forte of Mashpee, MA, built this great-looking, 62-inch-wingspan, 28-percent-scale Ultimac 10-300 biplane from the Ohio R/C kit. Weighing 16½ pounds, the model is powered by an O.S. 300 flat twin-cylinder engine swinging a 20x10 prop, and it has "unlimited vertical performance." It's covered with

Super MonoKote and controlled by a Futaba 7 UAPS radio and eight servos—one S-148 for each aileron and elevator and an S-130 for rudder. Don rates performance as "excellent."



#### GOLDBERG EXTRA 300 MINUS 40

After reading an article in *Air Progress* magazine about Patty Wagstaff's Extra 260, Lloyd Noel of St. John's, Newfoundland, Canada, just *had* to modify his two-place Goldberg Extra 300 and make it a 260. He says that scratch-building a single-place cockpit and cutting the canopy to fit wasn't too difficult. It's finished with MonoKote and Vinylwrite custom markings, and a friend hand-painted the Icarus symbol on the vertical stab. The 9½-pound model is controlled by a Futaba 7-channel PCM 1024 radio, and it flies well with its YS-120 4-stroke engine.



#### LUSCOMBE OBSERVER

This 1/4-scale Luscombe T-8F Observer is the work of Kent Durden of Grass Valley, CA. It's a scale model of the plane his father used for 19 years to spot fish along the California coast. The model is a J.M.D. Models kit that has been modified to make the "observer" version.

It has flaps, vacuum venturi, panel lines and rivets, lights, scale antennas, gas caps and a completely accurate interior. It's powered by a Saito 130 twin 4-stroke engine and weighs 18 pounds. We bet the fish didn't stand a chance!

# PILOT PROJECTS

## MENTOR MAKER

Bill Oats of Brighton, MI, built this Byron T-34B in white and green civilian markings for his friend Ron Wiley, who flew a T-34 while stationed at Castle A.F.B., MI, in the mid-'60s. Powered by a Saito .80 4-stroke engine, the model has Dave Brown retracts, functional flaps and—says Bill—it “flies just like the original.”



## REAR-WING SPORTSTER 9000L

Twenty-five years ago, Geoff Mower of Saffron Walden, Essex, England, bought full-size plans of the 9000L from *Model Airplane News* and built it as an uncovered display model. He was so taken with the design that he recently enlarged the plans

by 150 percent and changed the structure accordingly, but he left the original outline for a great sport-scale model. Weighing 5 pounds, the 9000L has a wingspan of 67 inches, it's powered by an O.S. .40 4-stroke, controlled by a Futaba 4-channel radio and finished with Solarspan. It has successfully completed about a dozen flights, and Geoff says "...this model represents the golden days of aircraft. ... I'm 67 and remember those times."

## NORWAY VIKING

"Olav Viking"—an impressive, 1/21-scale, 106-inch-wingspan model of a DC10-30 in Scandinavian Airlines Systems colors—was built by Steinar Gundelsby of Oslo, Norway. It's powered by a single O.S. .91 ducted-fan engine coupled to a Boss 602 Pro DF unit. (In the tail, we hope!) The retractable landing gear lifts 12 wheels, the wing includes working Fowler flaps, and the model's navigation lights and brake really

work. The 27 1/2-pound "Olav" uses spoilers for roll control, instead of ailerons, and Steinar says it's "almost ready for takeoff"—but *he* isn't! He's doing more tests and putting off that fateful day until the summer comes. (We know the feeling!)

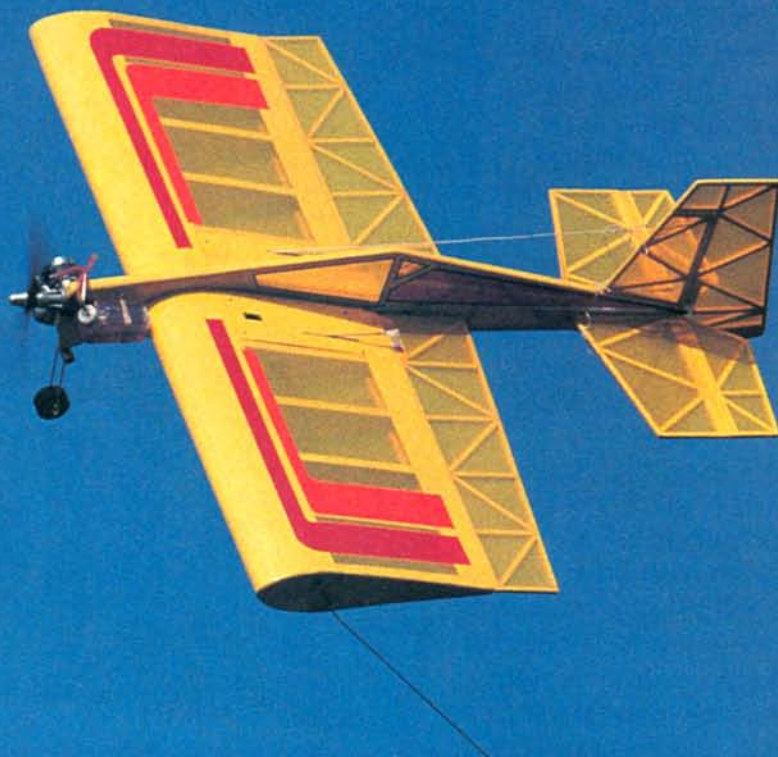


## BRITISH BULLDOG

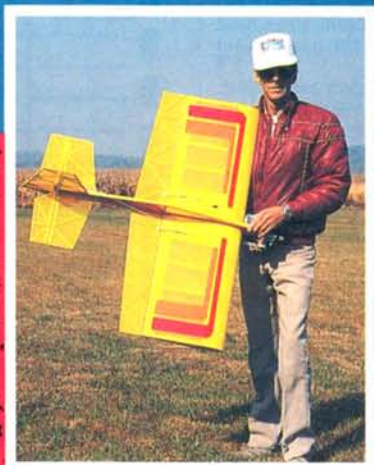
About three years ago, G.J. Dibben (Peterborough, Cambridgeshire, England) answered the call of John Roberts (Cantonment, FL) for Focke Wulf FW 190 plans, and they've been corresponding ever since. It was John who sent us this picture of G.J.'s Bristol Bulldog Mk II biplane—so we'd be able to appreciate his "outstanding ability." Powered by a Zenoah G-38, the 24-pound model has a 90-inch wingspan and includes functional rigging, sprung landing gear, aluminum panels, and a super, scale, dummy radial engine carved of balsa. The covering is nylon and the 1930 paint scheme is for "B" flight, Number 3 Squadron, Upavon, Wiltshire, England. The model is now being refitted with a Super Tigre G4500 engine to give it "a bit more snap." You said it, John—outstanding!



**W**HEN MY FIRST Hots™ appeared in the April 1984 issue of *Model Airplane News*, it was an immediate success. The plans were so popular that they remained top sellers for four consecutive years. Why is this? Simplicity of design and great flight characteristics. Those two elements not only made the original almost a household word, but they also have contributed to the success of its successors as well. In terms of flying and building, I've never heard a bad word about the Hots. Some clubs have even held fun-flys restricted to Hots only! The Hots™ and Super Hots are kitted by Midwest Products and remain good-selling kits to this day. The Ultra Hots, which I produce a giant-scale kit for, has sold in record-breaking quantities.



## THE NEXT GENERATION



by DAN SANTICH

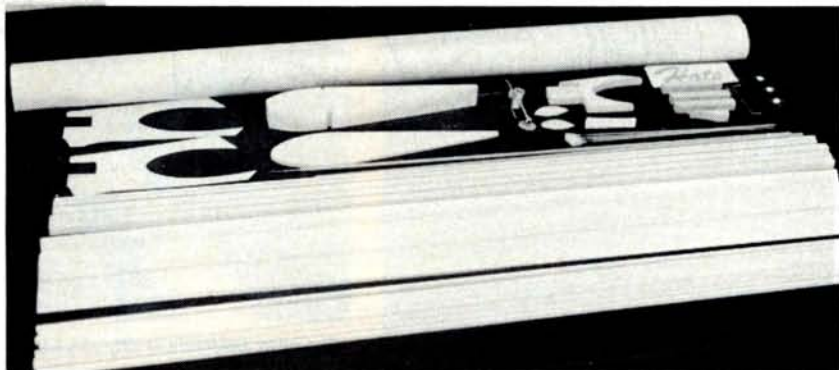
So what does all this mean? Modelers want something that will challenge their flying skills yet won't put them in bankruptcy during the process. They also want something that they can assemble

quickly. The Hots series of designs has filled a need. Enter the Fun Fly Hots.

# FUN FLY

# HOTS

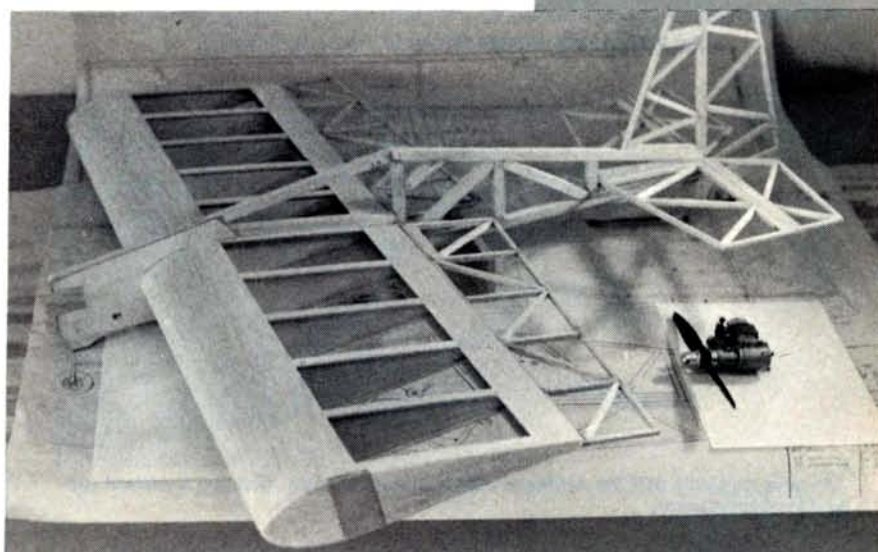
All the wood you need to build the Fun Fly Hots is available in the "scratch-builder's kit."



It wasn't too long ago that you could fly a Hots or an Ugly Stik in a competition fun-fly and stand a good chance of winning. Those days are gone! The competition fun-fly models that seem to be the rage today are little more than a wing and a tail with a powerful engine up front—no question about their flying capabilities. Some of them are absolutely awesome. I recently attended a competition fun-fly and was amazed by the performance displayed by this relatively new breed of design. The one thing that stuck in my mind was that you couldn't tell one from another—no character at all. Of course, it's a little difficult to dress up a model that has no fuselage other than a fiberglass shaft! That was when I decided to design a fun-fly model with an identity. The design would also have to stand on its own against these flying pool cues. This was a tall order!

The development process for the Fun Fly Hots took me nearly a year. My workshop is littered with the remains of 10 or so prototypes that, for one reason or another, didn't work out. (Interpret that as "crashed.") I wanted a highly maneuverable model, yet one that would fly at a walk-pace under full control. It had to have the roll rate of a blinking eye and be able to loop inside its own length. The Fun Fly Hots presented here has those capabilities and more. It's an absolute pussycat! Because of the very thick airfoil, the elevator and aileron response are very numb around neutral, but the control rate is proportional to your stick movement. Move it a little, and that's what you get from the model. Go full tilt and it will respond accordingly. Also, again owing to the thick airfoil, you have a built-in air brake. This makes it very easy to do quick touch-and-go's, either by wing-over or by looping. The wing-over method works best for me. I've managed 10 touch-and-go's in 18 seconds. That was the best flight; the average is 25 seconds.

The key elements to a good flying model are weight, balance and alignment. Pick only contest-grade balsa and make sure that the wing, stab and fuselage are on a zero-degree center line and that



The complete airframe should weigh no more than one pound.

your balance point is as shown on the plans. Use light servos and a 225mAh battery. Try to keep the flying weight under 3 pounds. I use the O.S.\* FSR ABC .32 engine with good results.

To get as many flights as you want at the field, check out the Ace\* FFC—fast field charger. Simply connect it to your 12V starter battery and it will keep your receiver and transmitter batteries fully charged.

Scratch-building is a lot of fun and it's cheaper than kit-building if you buy balsa in bulk. Since it may be some time until the Fun Fly Hots makes it into kit form, order your plans from *Model Airplane News* and then write to me. I'm beginning, with this model, what I call a "scratch-builders' kit." It contains all the wood necessary to build the model for only \$25, plus shipping. My address is at the end of this article.

## CONSTRUCTION

When you get your plans, the first thing you should do is check the wing from the center to each tip for equal measurements. Blueprint images

## SPECIFICATIONS

Type: Fun Fly competition

Wingspan: 40 inches

Length: 39 inches

Weight: 2 1/2 to 3 1/2 pounds

Wing area: 660 square inches

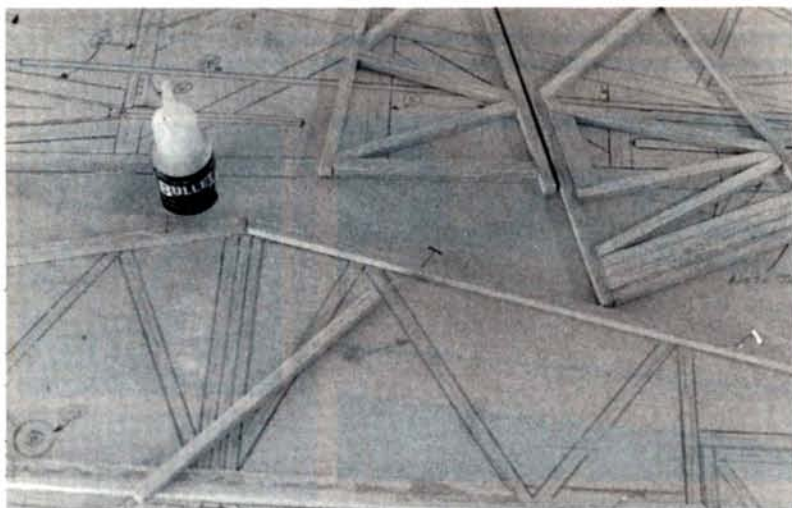
Wing loading: 8.7 to 12.2 ounces/square foot

No. of channels req'd: 4 (aileron, rudder, throttle, elevator)

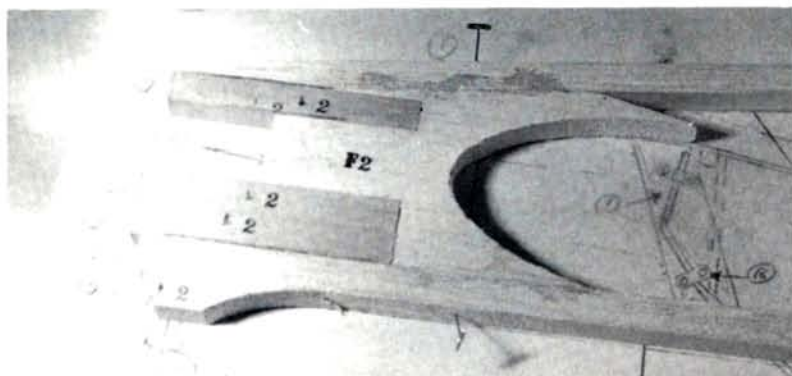
Airfoil: fully symmetrical

Engine: .25 to .40 2-stroke

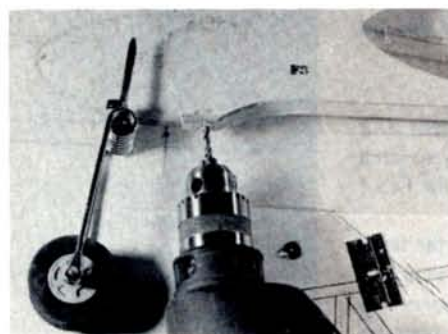




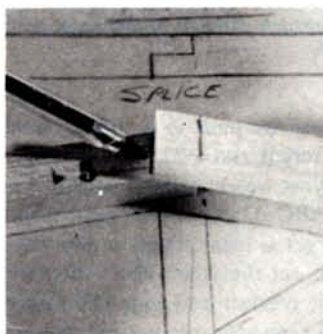
The tail assembly is made entirely of 1/4-inch balsa strips.



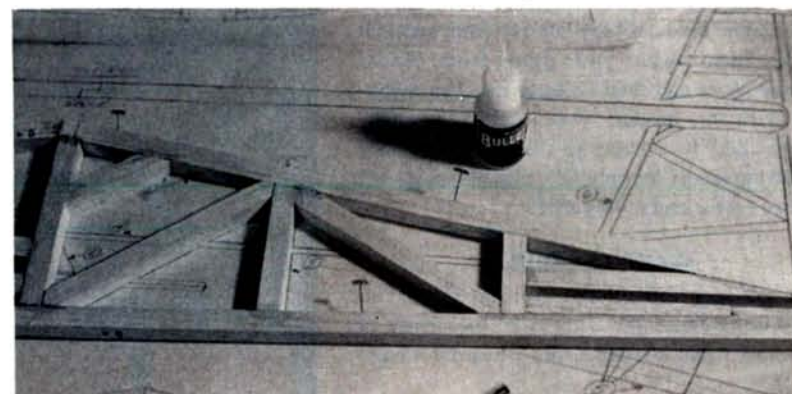
The nose assembly with the hardwood engine mounts in place. Note the hardwood support for the nose gear.



To prevent the Fuels nose gear from turning, file it before you insert it in hole.



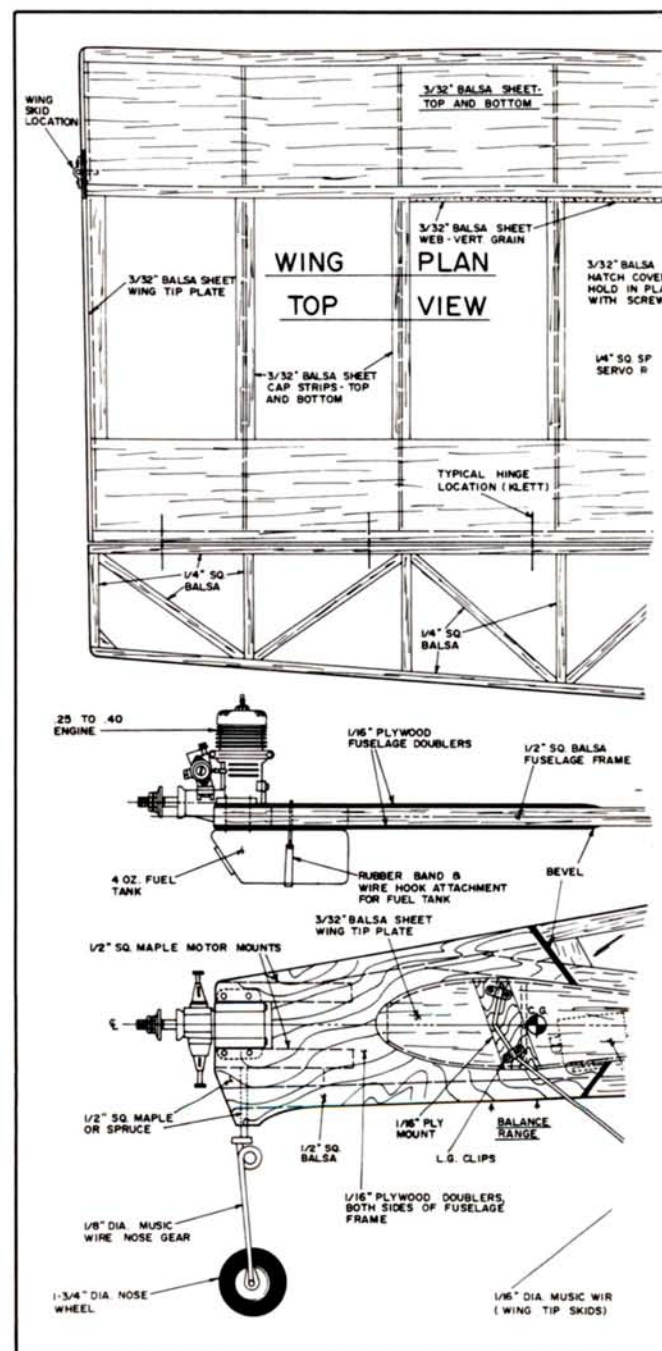
This joint in the fuselage structure is a lapped-joint and provides extra strength.



To be strong, the 1/2-inch square balsa fuselage framework should have tight joints.

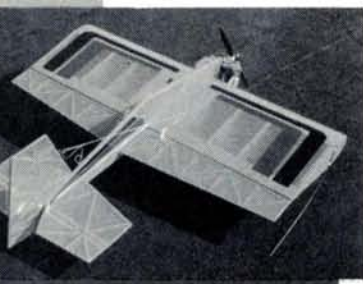


The wing assembly is very simple and built directly over the protected plans.





## FUN FLY HOTS



can be distorted during the reproduction process, and a difference of as much as 1/2 inch isn't uncommon. I use a combination of CA and Sig\* Titebond adhesives. Make sure that all joints fit snugly when you glue them.

### FUSELAGE

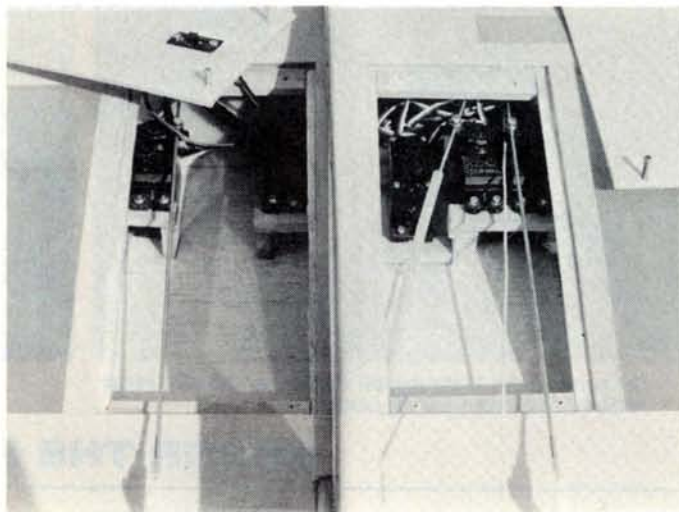
Lay wax paper over the fuselage drawing on the plans. Cut the top 1/2-inch-square crutch to length and pin it into place. Notice the notch location in the two pieces. Cut the bottom crutch to length and pin it into place. Cut the angle on the lower front of the top crutch for the engine mount, and then glue the 1/2-inch balsa F2 former into place. Glue the 1/2-inch hardwood engine mounts into place and the two 1/2-inch square hardwood supports below the lower engine mount. Glue all remaining 1/2-inch-square balsa pieces to form the fuselage side. Glue the 1/16-inch plywood formers to each side of the nose, and then sand the entire fuselage assembly.

### TAIL ASSEMBLY

The entire tail assembly is made of 1/4-inch-square balsa strips. Protect plans with wax paper and simply cut, pin and glue the pieces together. Again, try to make all joints as tight as possible.

### WING

Pin the 1/4-inch-square balsa spar over the plans and glue the ribs to the spar. Now glue the 1/4-inch-square balsa strip to the trailing edge of the ribs. Glue the top spar into place and then glue the 1-inch triangle leading edge to the front of the ribs. Glue the trailing-edge sheet-balsa into place, put a weight on the rear of the wing, and glue on the leading-edge sheeting. Turn the wing over and sheet the opposite side. Glue the center-section sheeting only to the wing's lower surface, and then add your capstrips. Glue the 3/32-inch balsa shear web (vertical grain) into place, and then cut



*The servos are all installed in the wing, left to right: left aileron, elevator, throttle, rudder, right aileron. Note that the throttle servo is inverted.*

access holes in center section of the webbing for receiver and battery access. Glue the wingtips into place and add plywood supports for outriggers. Make the ailerons of 1/4-inch-square balsa strips, as you did with the tail assembly.

### FINAL ASSEMBLY

Insert the wing into the fuselage slot, and mount the horizontal stab. Make sure that the wing and stab are parallel to each other, and glue them into place. Glue the fin in place and drill a hole for the nose gear where shown. I use the Fults\* RF 400 nose gear, and I file flat spots on each side at the top so that it won't pivot after I've glued it into place.

Sand everything with 200-grit paper and finish it with 400-grit. Apply your mind-bending color scheme with your favorite covering, and install your hinges and control surfaces.

The outrigger skids on the plans work well with the small wheel in the rudder. This gives you excellent ground handling, and you won't have to worry about it spinning around on you the way that some other fun-fly models do.

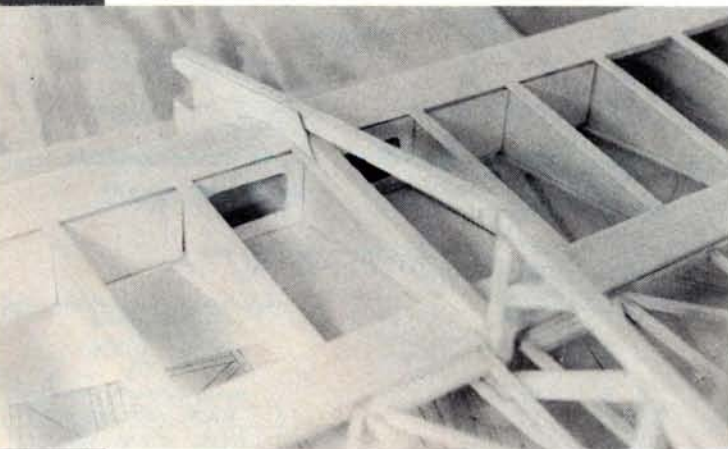
Mount your engine and check the balance. Place your servos so that your model balances slightly nose-down.

### FLYING

Make sure all controls are in the proper direction. The amount of control travel isn't critical, although you certainly want enough to fly the airplane. Start out with 1/2 inch up and down on the ailerons and 1 inch up and down on the elevator. The rudder is very effective, so start with minimal travel. The takeoff is quite easy, and once it's in the air, you'll be surprised by its handling characteristics. It's really a gentle airplane, yet it will turn on a dime when you want it to. You can haul in full up-elevator and it won't stall or snap.

For the scratch-builder's kit write to Dan Santich Models, Inc., Rt. 2, Box 293, Pinnacle, NC 27043; (919) 368-9644.

\*Here are the addresses of the companies mentioned in this article:  
O.S.; distributed by Great Planes Model Distributors, P.O. Box 9021, Champaign, IL 61826.  
Ace, 116 W. 19th St., Box 511C, Higginsville, MO 64037.  
Sig Mfg., 401 S. Front St., Montezuma, IA 50171.  
Fults Tooling, P.O. Box 95, Champaign, IL 61820.



*The completed wing is slid into the cutout in the fuselage and glued into place. It must be installed perpendicular to the fuselage and aligned with the horizontal stab.*

# THE MURDER OF A STARSHIP

*...and a warning to all*

by THOMAS L. KRASIN & DANIEL L. SCHERRY

I HAD BEEN SITTING in my office looking at the tip-sail from the wing of a scratch-built R/C Beechcraft Starship. My flying buddy Dan, who is an exceptional scratch-builder, had the other tipsail. These were the only pieces left of a plane that was "murdered"! When this happens to people, people go to jail. People may go

to jail for this, too!

The story started several months ago at the field. I had produced a marketing video for a company that makes titanium-alloy products. In that video, I had used some footage from Beechcraft that included its plane the Starship. The plane fascinated me immediately; it was gorgeous.

During a conversation

with Dan, I had said, "You know, we ought to build a Beechcraft Starship." He had laughed.

About a week later, Dan showed up at the field with a book that documented all the Beechcraft planes. Sure enough, in the back of the book was the Starship. I knew that I had Dan hooked. (That was August 1991.)

A few weeks passed, and the conversation about the Starship became more serious, especially when I volunteered to fund the project and call Beechcraft for some three-views.

The leaves in our area had gone through their riot of color, and the air had a bite to it. Clouds began to be the norm rather than the rich blue sky we all love to bore holes in. A bulky envelope arrived in the mail.

Beechcraft had sent a lot: several 8x10 glossies, a detailed three-view and two detailed drawings of a 1/32-scale model. We were impressed, and things were getting really serious as the first snow began to fly. Winter had not only knocked on the door, but it had also come to stay for a while.

During the next couple of weeks, Dan and I poured over the material we had received. We had a problem. The plane we wanted to build was 1/8 scale, and the amount of time involved in trying to re-draw everything looked prohibitive.

So, armed with the vellums, I thought I'd get my local blueprint shop to enlarge the drawings. (Sometimes I'm so smart.) "How much?" I said, gulping a bit, as my wallet tried to crawl out of my pocket and run.

"Yeah, that's right," I was told, "about \$650. It's a lotta work, and we'll have to cut these up and do it section by section." A little voice in my head said, "No way, Jose!" I mumbled something about getting back to him and returned home more than a little down. Maybe this wasn't going to happen after all. Maybe it shouldn't have.

## OUR FIRST REAL SNAG

About a week later, I showed the drawings to another flying pal and related the problem of enlarging them. He thought that they had been done on a CAD (Computer Assisted Design) system, and he suggested that Beechcraft might come through with a 1/8-scale set. After some doing, I received a set of 1/8-scale drawings from Beechcraft—all 33 feet of them. Merry Christmas to all!

I called Dan. "Hey, you won't believe what just came in the mail. I'll be right over."

In January, our club held an unofficial New Year's Day Fun Fly—hot dogs, a fire in a barrel, slop and glop all around, guys taking off and landing with varying degrees of success on the mushy cinder parking lot and doing touch-and-goes off picnic tables. Winter had just started, and flying fever had rotted a few brains already, and for Dan and me, the Starship project was beginning to take shape! Dan had templates and a materials list in the works.

Now came an almost daily series of ques-



"Gee, we made it!" Authors Tom Krasin (left) and Dan Scherry are justifiably excited after completing the project. Little did they suspect what would ensue.

tions and debates about the very real problems involved with scratch-building an R/C plane. As far as Beechcraft knew, no one had ever built the Starship before.

Step by step, the bird began to take shape—wing spars, carbon-fiber laminates, ribs, Warren trussing, jigs and lightening holes. The 7-foot wing had to be light and strong with no twists.

Part by part, it went together until, finally, the main wing was finished except for the sheeting. Next came the servos and the pushrods, the tipsails and—wow!—it was starting to look impressive. The forward wing, the elevators and the control rods were a challenge because of the swept configuration.

## OUR SECOND REAL SNAG

Whoops! Hold everything! Dan had a full-size silhouette of the fuse hanging in his basement. Little plastic cups filled with lead weights were hanging from the fuse. He was not happy. After he showed me our problem, neither was I.

The CG was way out of whack. This aircraft has a twin-turbo pusher-prop propulsion system, which means a ton of weight is sitting—no, not sitting—hanging off the wing's trailing edge about seven-eighths of the way down the fuse. Dan had hoped to keep the aircraft's weight at about 12 pounds, with 14 pounds as the outside limit. This would allow us to keep the wing loading between 27 to 34 ounces per square foot.

The engines and their power output had been a source of concern from the onset, although I had never really thought we had a problem. Worst case, we'd go to a couple of Super Tigre 61s ABC at 1.85hp each. No sweat! Wrong, nitro breath!

No way could we hang 3+ pounds off the back of the wing and ever get close to the CG. The engines had to weigh no more than 1 pound each, with mufflers. Even so, we still

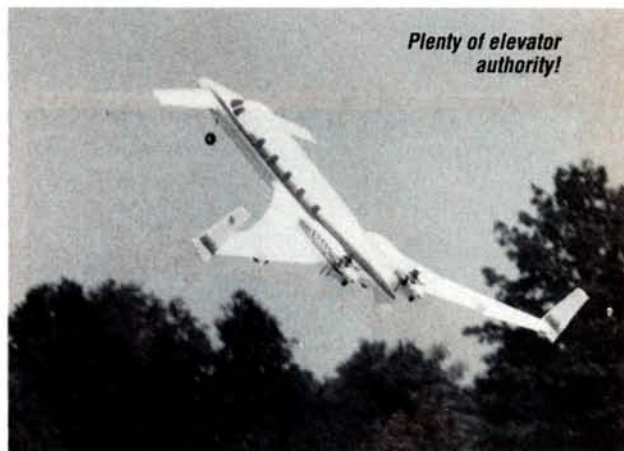
had to stick 12 ounces of dead weight in the nose. I really had a problem with that; so did Dan.

Now I got a real surprise. I called kit manufacturers to ask about the formulas that they use to match planes with engines. Hang on to your hats, folks; there ain't none. Nope, they do it by hook and by crook. If they think it might work, they test it out. This really threw me for a loop! (Pardon the pun.)

Finding the right engines took some real digging. Some manufacturers publish brake horsepower, but you don't know how that translates into thrust.

Others flat-out don't publish horsepower figures or any other kind of evaluative data. It can be very confusing, to say the least. Everyone we talked to had an opinion, but no one could come up with a pair of engines that we thought would meet our specs: maximum available horsepower and minimum weight.

To solve the CG problem, we elongated the fuse by 8 inches. The engines?—well, with the help from some people who publish R/C aircraft magazines, the consensus was Webra's Speed 50. More on that later.



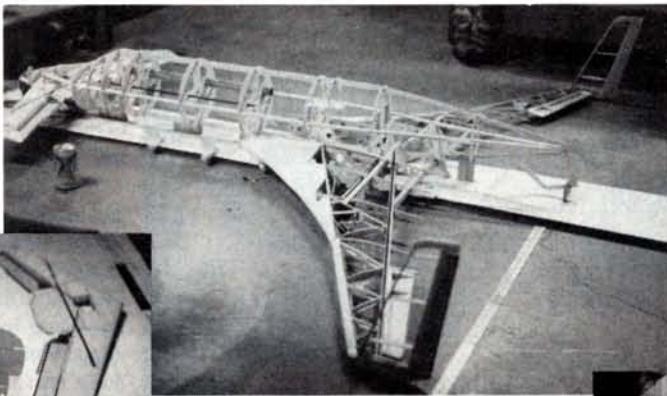
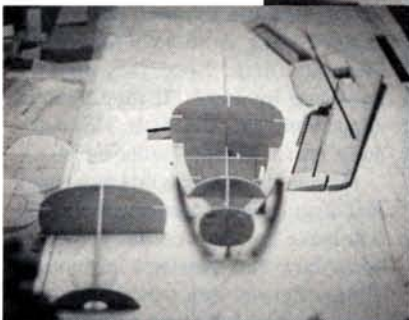
Our to-do list grew shorter as the days grew longer and things began to turn green. The white of winter moved from the trees and the grass to the sheeted skin of the Starship, which was accented with navy blue and maroon striping, NASA gray windows and the "Stars and Stripes" riding proudly on each tipsail. An absolute work of art. On May 4, our "baby" was born—13 pounds even, but was it ready for what lay ahead? It turned out that no one was.

## FIRST FLIGHT

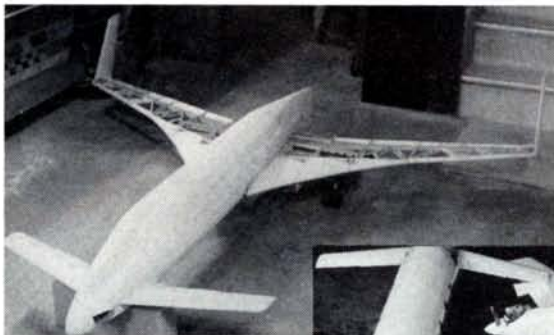
Thursday, May 7, 11 a.m. Dan and I conferred with Ray, our club's chief flight instructor, to see if we could fit the wing into my car and the fuse into Dan's car. (Ray had a van, just in case.) The wing was one 7-foot hunk, which

## THE MURDER OF A STARSHIP

**Right: the framed-up starship prior to sheeting. Note the lightening holes and structural elegance.**  
**Below: at the beginning of the building project, the canard and nose frame can be seen along with bulkhead templates.**



*Dan walks the Starship out to the flight line.*



**Above: Tom and Dan did an outstanding job when they sheeted this sleek aircraft. Right: the fuse and main wing separate for transportation.**



**Above: the wings have been sheeted, and the engine mounts are nearly done.**



included the engine nacelles and removable tipsails. After several tries, we got the wing into the car; the fuse was much less trouble. Off we went to the field. Ray had a good time at our expense.

It was a perfect day for engine break-ins and taxi tests. A gentle breeze was out of the north at about 5 to 10mph, there was sunshine aplenty and the temperature was about 60

degrees. Other interested club members were also there, and cameras and camcorders were in evidence. It was definitely a photo opportunity.

The engines took their normal share of coaxing, but the plane really had a voice when both engines were roaring at 11,600rpm with 11x6 props. One question was answered without a doubt; the Webra Speed 50s are more

than capable of providing adequate power. We had power to spare and then some. The day ended after we blew the cap and stinger off one of the modified Webra mufflers. All in all, everything was quite satisfactory, thank you.

*Wednesday, May 13, 11:30 a.m.* Dan's house. Same crazy fire drill with the wing, but we were learning. We met Ray and others at the field. This might be *the* day. One engine still needed some tweaking. Dan and I were charged with nervous excitement. The weather was excellent; it was about 75 degrees.



**Above: early CG tests are performed on a profile mockup.**

We pinched both fuel lines while fastening the wing, and that led to some comic moments as Dan and I got sprayed when the fuel pump blew the line off the pump-output nozzle. Once corrected, we began a final dial-in of the engines, and then we turned the radio over to Ray for a couple of high-speed taxi runs before takeoff.

Oh, my gosh! The Starship leapt off the ground with a straight-up attitude of about 6 feet. Ray was quick enough to kill the throttles but it banged down tail skid first and then over onto the gear with the engines still idling. The damage was relatively minor, but it was enough to halt activity that day.

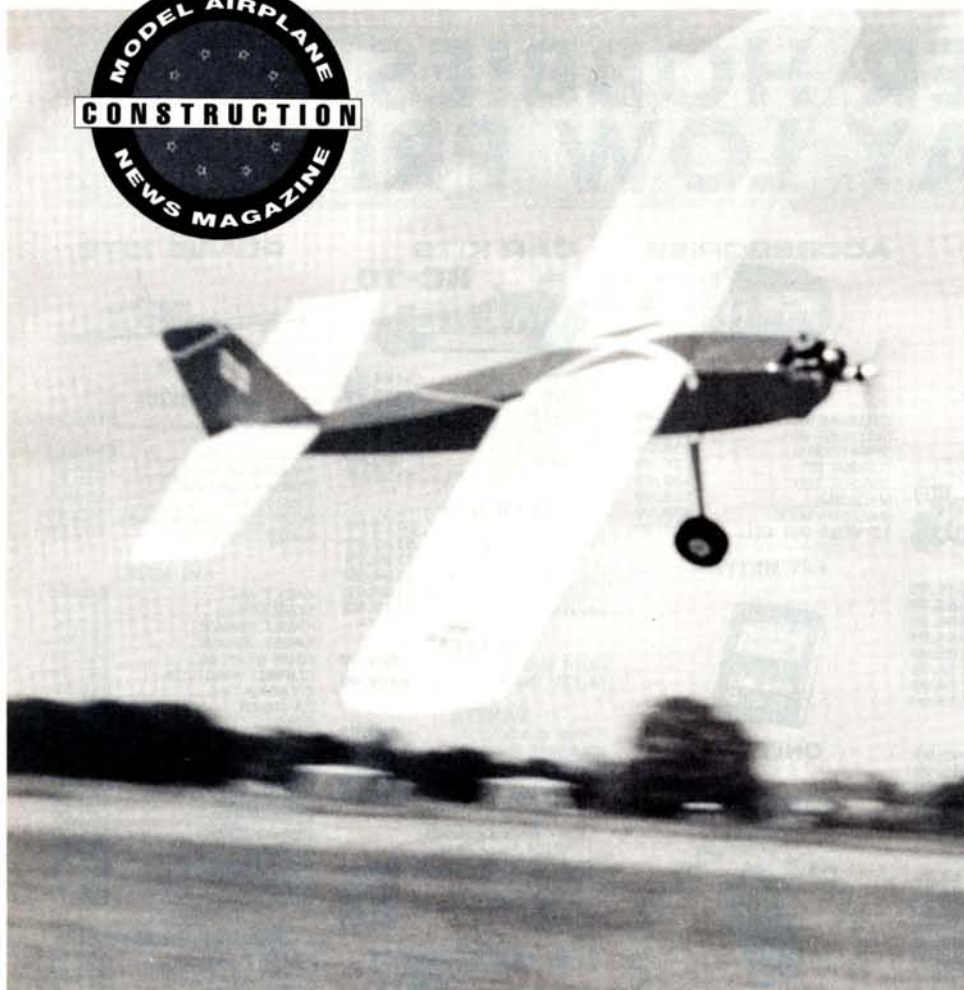
During his debriefing, Ray said: "I just barely touched the elevators, and it jumped off the ground and surprised me!" That's an understatement, but we did gain some very important information.

*Monday evening, Memorial Day, May 25.* The phone rang; it was Dan, whom I hadn't seen for a few days. He said: "Well, it's all set; ready to go." I sensed some frustration in his voice; I felt it too. The weather had been crummy, but the forecast for Thursday was supposed to be perfect, so we agreed to make a go/no-go decision that morning by phone. The plan was to meet at 11 a.m.

*Thursday, May 28, 11:30 a.m.* Dan's house. The wing fit into my car with practiced ease, and we were off to the field. This was *the day!*

Dan and I were charged up, and so was everyone else. The cameras and camcorders were ready, and so was the Starship. We changed the elevator setup and added weight to the nose so the forward wing wouldn't

*(Continued on page 58)*



# LIL' EASY

by RANDY RANDOLPH

**It's the  
simple  
things  
that  
count**

**T**HE FIRST "EASY" made its public debut in the May 1987 issue of *Model Airplane News*. It was designed to be an easy-to-build and easy-to-fly airplane for .40 to .50 4-stroke engines. It was a friendly sport airplane that would be ready to fly at a moment's notice. Although it was not intended as such, a number have been used very successfully in training programs around the country. Its lightness, coupled with its ability to stay in the air at relatively low air speeds, seemed to appeal to club flight instructors as well as to those of us who enjoy relaxed sport flying.

Lil' Easy is a scaled-down version of the big guy and is just right for engines in the .10 to .15 range. It is stout enough for the hot .20 4-strokes, but most of the flying done with those engines will be a waste of the power available because of all the reduced throttle operation. With the hot little Enya\* 11-CX in its nose, the airplane is actually a little on the overpowered side.

Even though Lil' Easy can be quick and aerobatic, when the power is pulled back, it becomes the same gentle airplane as its big pussycat brother. Slow flight is slow, and landings are very kind to the pilot. I know of no other airplane in its power range that has such a wide performance envelope.

This is a "plain vanilla" airplane, so it is an easy airplane to build. The slab sides, solid-sheet tail and semi-flat-bottom wing all contribute to its being quick to build. There is lots of room in the cabin area for almost any radio system and enough finger room to make it easy to install. If you have never built an airplane from magazine plans, this might be the one to try.

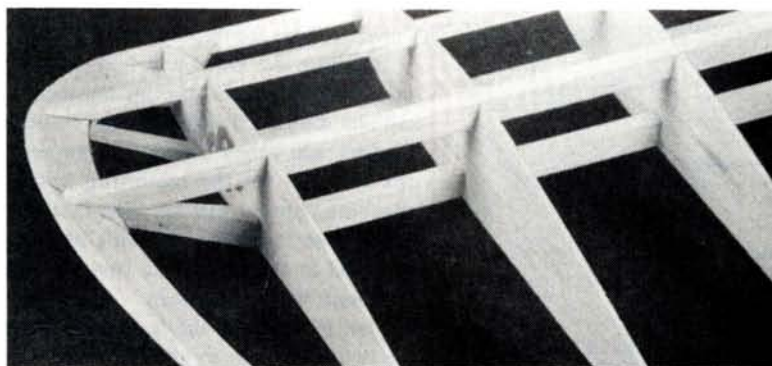
## CONSTRUCTION

As a rule, the wings take more time to construct in any airplane, so they're a good place to start.

Make the ribs out of 1/16-inch balsa sheet. They can be cut out of a "printed sheet" made by tracing around a card-stock template onto the balsa sheet with a fiber-tipped



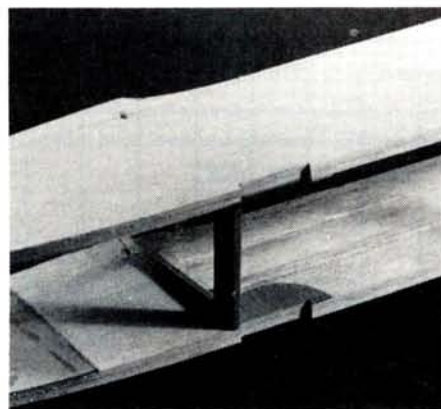
*The .40-powered Easy was shown in the May '87 issue of Model Airplane News. Lil' Easy has the same gentle flight characteristics*



*Rounded tips that slant up to the top spar add a little something to an otherwise boring constant-chord wing. The small washer glued to the tip rib balances the wing laterally.*

pen; or they can all be cut out at the same time by stacking balsa blanks together, tracing the rib pattern onto the top blank and then cutting all the ribs out simultaneously with a band saw or a jigsaw.

Trim  $\frac{1}{16}$  inch off the top and bottom of four ribs, and enlarge the main spar notches to receive the dihedral braces. These are the center-section ribs. Cut the shear webs out of  $\frac{1}{16}$ -inch sheet (notice the grain; it should run vertically). Strip the spars out of the appropriate sheet wood. (Use a straightedge and razor knife, or one of the available balsa strippers—depending on your choice of wood.)



*A right triangle is handy when joining the fuselage sides. Notice the cutout for the landing-gear mount and the plywood doubler in that area.*

The main spars should be cut out of medium-hard, straight-grain wood, and the other spars and the leading edge should be cut out of medium wood. The  $\frac{1}{16}$ -inch trailing-edge sheet is also made of medium balsa, as are the  $\frac{1}{8}$ -inch tip pieces (notice the grain in each of the tip pieces).

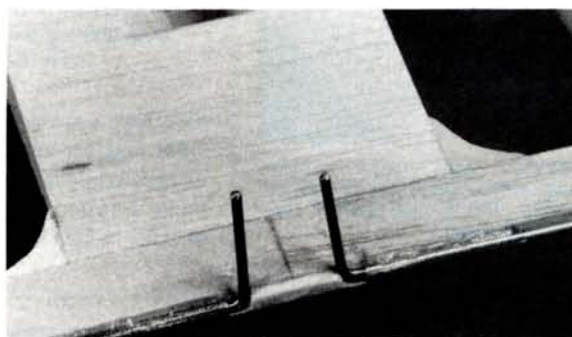
After covering the plan with wax paper, start to build the left wing by pinning the bottom main spar into place on the plan. Slip some ribs onto the spar, and use them to position the trailing-edge sheet so it will match any slight difference there might be between the length of your ribs and those shown on the plan. Pin the trailing edge into place and, starting with the second center rib, glue the ribs to the spar and to the bottom trailing edge.

When all the ribs and webs have been glued into place, add the top main spar. (Make sure that it is glued to the webs as well as to the ribs.) The front top spar and leading edge are added now, but don't add the top trailing edge sheet just yet; it will be installed after the wings have been joined at

the dihedral joint. Build the right wing in the same way.

The two center ribs are cut in half at the main spar and the two nose ribs are joined. The back half of each rib forms the aileron servo-well sides. Bevel the leading and trailing edges at the center to match the dihedral angle, and join the wing panels with the dihedral braces. Install the center ribs, then the front bottom spar and the top trailing edge, and sheet the center section. The sheeting goes between the spars, leaving the bottom of the servo well open. The tips are glued to the two tip ribs. (Notice that they slant upward to become flush with the top of the top spar stubs.)

The ailerons are made of  $\frac{1}{4}$ x1-inch stock that's tapered to  $\frac{1}{16}$  inch at the trailing edge. (Tapered stock can be bought, or square stock can be sanded to shape.) Two-inch pieces of aileron stock are glued to the trail-



*The aileron torque-rod assembly is made of  $\frac{3}{32}$ -inch music wire inside  $\frac{1}{8}$ -inch brass tube. If thick Hot Stuff or UFO\* glue is used to anchor the tube to the trailing edge, there will be less chance of glue running into the tube.*

ing edge between the last two ribs and then sanded to blend into the tips.

Make the aileron torque rods by slipping brass tube over the  $\frac{3}{32}$ -inch music wire then bending the wire to the shape shown. Note that there is a left and a right torque rod. Mark the position of the torque-rod arms on the trailing edge and, to give the arms free movement, relieve the trailing edge at these places by sanding with a piece of rolled sandpaper. Glue the brass tube into place on the trailing edge; be careful to avoid getting glue in the tubes, and check that the left one is on the left side, etc.

Hold the ailerons against the torque rods, and drill the leading edges to match the barbs on the end of the rods. To allow the torque rods to seat and to close the gap between the ailerons and the wing, slightly hollow out the leading edges from these holes inboard. The ailerons are mounted after they and the wing have been covered, using one of the thick Hot Stuff\*-type glues to secure them to the torque rods.

The servo will be mounted on a plywood tray that is glued to scrap balsa risers at both ends of the servo well. Standard aileron

## SPECIFICATIONS

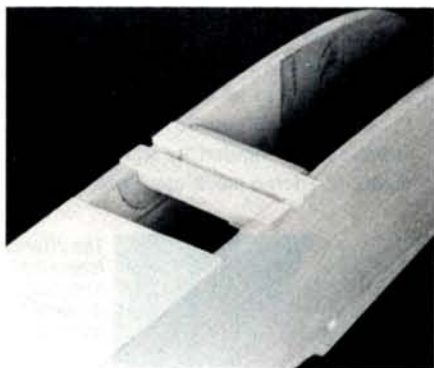
**Type:** Sport plane  
**Wingspan:** 48 inches  
**Weight:** .35 ounces  
**Wing area:** 405 square inches  
**Wing loading:** 12.5 ounces/square foot  
**Power req'd:** .10 to .20 2-stroke  
**No. of channels req'd:** 2 to 4  
 (ailerons, elevator, rudder, throttle)

**Features:** simple, slab-side fuselage and constant-chord wing. This is a good project for first-time scratch-builders.

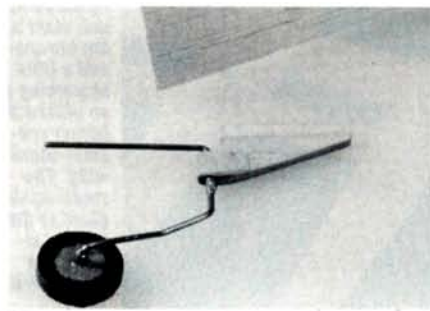
**Comments:** this design has a very wide flight envelope. It will land at a crawl with its 12.5 wing loading, and it will get up and go for fliers who love high-speed aerobatics.

hardware is used to connect the aileron horns to the servo.

The stab-elevator and fin-rudder are cut out of firm 1/8-inch sheet balsa. To help eliminate the chance of warping, cross-grain sheet is added to the tips. The elevator carry-through is a piece of 1/8-inch hardwood dowel. When the fin and stab tip have been glued into place, join the mating surfaces and sand the tip outlines to blend with the inner parts and conform to the shape shown on the plans.



The balsa sheeting is butted against the landing-gear mount, which extends 1/16 inch above the fuselage sides. The 1/32-inch plywood firewall doubler is visible here.



The tail wheel and tail-wheel mount are both homemade, but there are excellent commercially available substitutes. Note the rod exit in the fuselage side.

## FUSELAGE

The fuselage sides are made of medium 3/32-inch balsa sheet. The doublers are also 3/32 balsa with 1/32-inch plywood triplers in the nose area. When the doublers and triplers

**"With full power, almost anything you want to do can be done"**

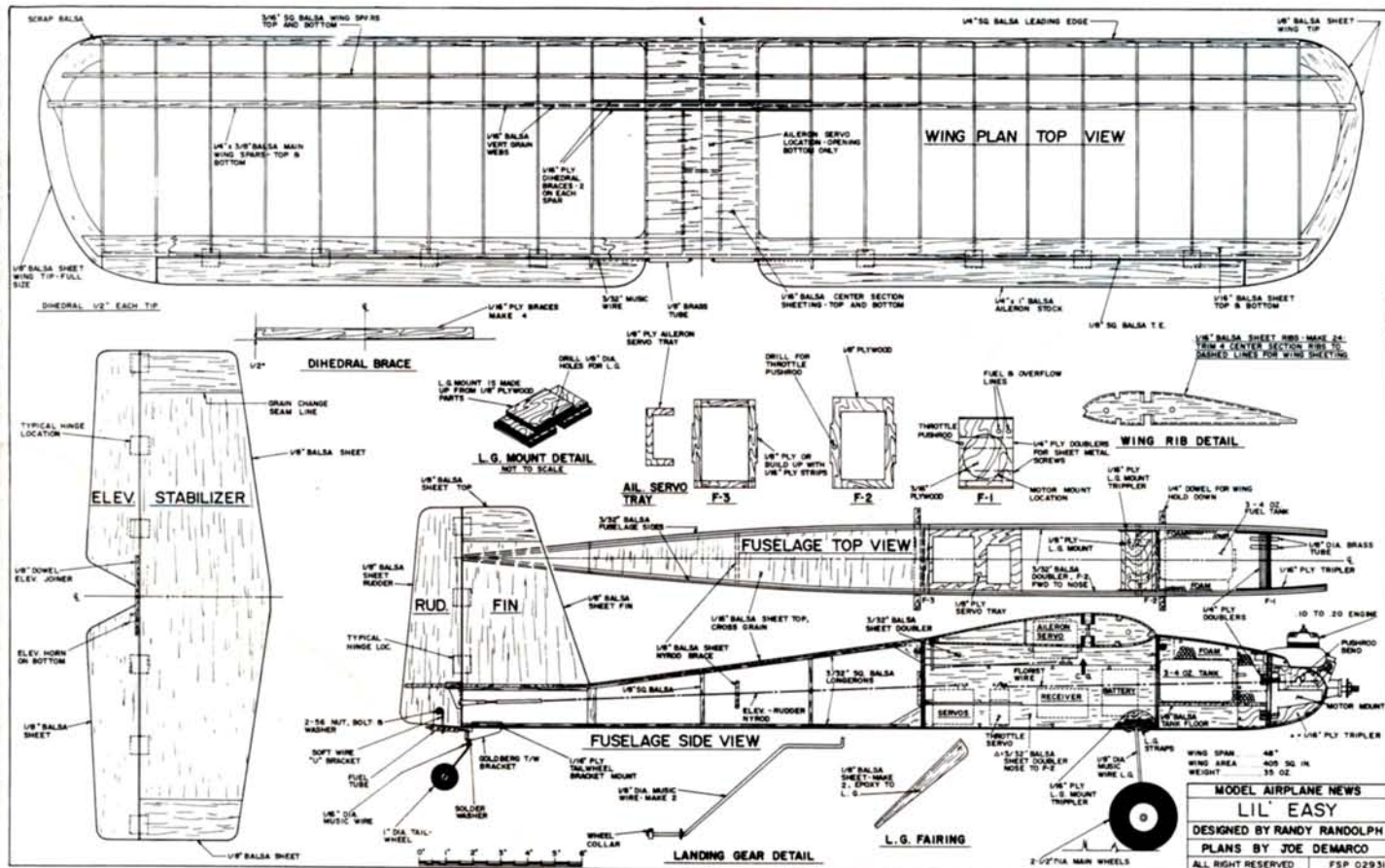
have been cemented into place, pin the two sides together and sand them to the same outline. While they are still pinned together, make a cutout for the wing saddle and drill the 1/4-inch holes for the wing-holding

dowels (if you use that method).

Separate the sides and add the servo-mounting rails and those for the tank. Cut out and drill the firewall and the two cabin formers, and epoxy T-nuts onto the rear of the firewall for the mounting bolts. If machine screws will be used instead of bolts, glue 1/2-inch-wide strips of 1/8-inch plywood to the rear of the firewall where the T-nuts would have been.

Start to assemble the fuselage by gluing the two cabin formers into place on one of the sides. Check with a right triangle to ensure that the formers are perpendicular to the side. When the glue has dried, glue the other fuselage side to the formers, making sure that it is perfectly aligned with the first. Bring the tail halves together and glue them, then carefully glue the firewall into position.

Sheet the bottom of the fuselage from the back of the wing saddle to near the tail with 1/16-inch balsa (the grain should run across the fuselage). At the tail, the balsa is replaced with 1/16-inch plywood to take the tail-wheel mount. Build up and glue the landing-gear mount into place just behind the first cabin former. Install the Nyrod guides from the cabin area to the tail. Drill the Nyrod supports, trim them to fit between the fuselage sides, slip them over the



Nyrods and epoxy them into place.

Epoxy the 1/8-inch-copper-tube fuel-feed and overflow lines and throttle linkage tube through the firewall, and install the floor in the tank compartment. Wedge the tank into place with foam, and connect it to the copper tubes with fuel tubing. Watch for and eliminate kinks in these lines. Finish the cross-grain sheeting and sand the completed fuselage.

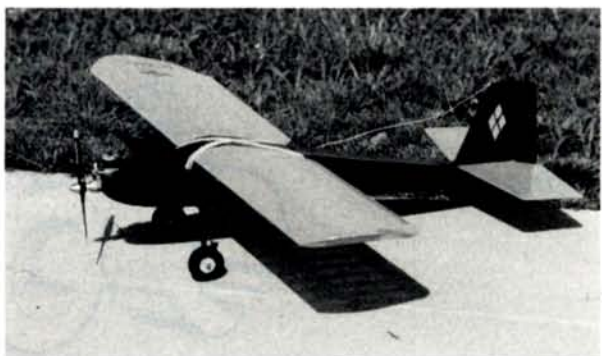
On my original, I covered the wings and stab with transparent MonoKote\* and the fuselage and rudder with Coverite's\* Black Baron Presto. If you're an old-timer who likes the look of doped silkspan, try Coverite's Micafilm; it's very light but strong. Whichever covering you choose, follow its manufacturer's application instructions. The original's aileron and elevator hinges were MonoKote, and Black Baron film was used on the rudder, but you can hinge the surfaces in your usual way.

Trim the covering away from the bottom center of the stab, which will contact the fuselage, and trim a 1/8-inch-wide strip off the center of the top to receive the fin. When the surfaces have been hinged, cement the fin to the stab and then the stab to the fuselage. Check alignment all the way.

Make the tail-wheel bracket out of 1/8-inch ply with 1/32 ply doublers on either side. Install the brass bearing, and bend the tail-wheel axle and steering arm while they're in the bracket. Trim a notch in the 1/16 ply tail-wheel mount and epoxy the mount into place. Bend the U-shaped tiller holder, and slip a piece of fuel tubing over the tiller before capturing it in the holder and attaching it to the rudder with a 2-56 bolt and nut.

Before installing the engine mount on the firewall, it is a good idea to paint the firewall with epoxy. When the engine has been mounted, attach the fuel line to the carb and the overflow line to the muffler, if pressure is desired. Run a piece of soft iron wire through the throttle Nyrod, and connect it to the throttle arm. A U-shaped bend in the wire at the arm offers a method of adjustment and relieves strain on the servo. Bend up the landing-gear legs, add the wheels, and hold them in place on the gear mount with metal brackets and small wood screws. The gear-leg fairings are 1/8-inch balsa, cut to shape, sanded, glued with Hot Stuff to the legs then covered to match the fuselage. Two-and-a-half-inch wheels look fine and work well on grass fields.

Before installing the radio, assemble the airplane and check the balance point. Move the battery pack and servos around until the plane balances at the point indicated on the plans, then install the radio to maintain this balance. Connect the elevator and rudder to the servos with Nyrods, clevises and horns.



Lil' Easy—a slab-side "stick"-type airplane for .10 to .20 engines.

Make a Z-bend in the throttle wire to engage the throttle servo. Check to see that everything reacts properly to the transmitter controls and, after a range check, the airplane will be ready to fly.

## PERFORMANCE

Try some taxi tests first. Lil' Easy is very solid on paved runways and turf, and it should track with very little corrective rudder. For the first takeoff, use plenty of runway, and once in the air, let the speed build. Unless there are some undetected warps, any trim needed should be well within the limits of the transmitter trim controls.

At altitude, try a few power-off stalls to get the feel for landing. You will find that Lil' Easy will fly quite slowly with full control at minimum throttle. On the first landing, try to hold it off as long as you can, and it will settle in as nicely as you please.

With full power, almost anything you want to do can be done. With the balance point shown, snaps are tight yet comfortable; slips and knife-edge are easy; rolls are smooth, with little or no altitude loss—even without corrective elevator; inverted snaps and spins and all outside maneuvers are just about the same as upright ones. Lil' Easy is easy—and fun!

\*Here are the addresses of the companies mentioned in this article:

Enya Model Engines/Altech, P.O. Box 286, Fords, NJ 08863.

Hot Stuff; Satellite City, P.O. Box 836, Simi Valley, CA 93062.

MonoKote/Great Planes Model Distributors, P.O. Box 9021, Champaign, IL 61826.

Coverite, 420 Babylon Rd., Horsham, PA 19044.

UFO; distributed by Satellite City (address above).

## 2 METER WINDSURFER



Sheeted and cap strip wings, flat bottom with wash out. Plug-in wings for easy transportation. Plug-in and flying stab, canopy, are just a few of the features of the Windsurfer.

Wing Span: 78 1/2 in. Length: 42 1/2 in.  
Wing Area: 544 sq. in. Airfoil: Flat Bottom  
Highlift

## WINDSURFER 100

Wing Span: 98 1/2 in. Length: 45 in.  
Wing Area: 790 sq. in. Airfoil: Modified 205

## EZ-1 GLIDERS



Wing Span: 78 1/4 in. Est. Flying Wt.: 26 ounces  
Wing Area: 544 sq. in. Airfoil: Modified 205

## EZ-2 "100"

A larger version of the EZ-1, easy building with turbulent spans, an open class glider that can perform with the best of them. Plug-in wings for easy transportation. Stress for high starts.

Wing Span: 98 1/2 in. Est. Flying Wt.: 45 ounces  
Wing Area: 790 sq. in. Airfoil: Modified 205

## TERCEL GRENADE-LAUNCHED



Wing Span: 50 1/2 in. Flying Weight: 11 1/2 ounces  
Wing Area: 275 sq. in. Airfoil: Modified 205  
Length: 31 1/4 in.



Wing Span: 50 1/4 in. Est. Flying Wt.: 11 1/2 ounces  
Wing Area: 270 sq. in. Airfoil: Modified 205

## KASTAWAY



Wing Span: 59 inches  
Wing Area: 380 square inches  
Est. Flying Weight: 15 ounces  
Airfoil: Modified 205



BRIDI AIRCRAFT DESIGNS, INC  
23625 Pineforest Lane  
Harbor City, California 90710

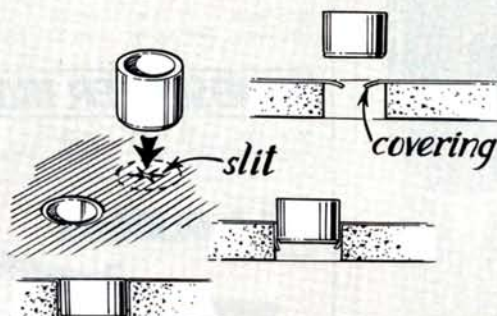
(213) 326-5013 549-8264

# HINTS & KINKS

J I M N E W M A N



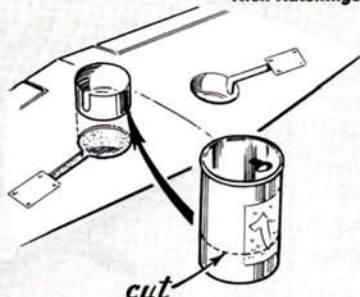
Model Airplane News will give a free one-year subscription (or one-year renewal if you already subscribe) for each idea used in "Hints & Kinks." Send a rough sketch to Jim Newman c/o Model Airplane News, 251 Danbury Rd., Wilton, Ct 06897. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO, AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we can't acknowledge each one, nor can we return unused material.



## NEATLY FINISHED HOLES

Here's how to make neat holes through a structure and its covering material. Drill the holes through the structure before you cover it, then make slits as shown. Cut a short piece of aluminum tube or Nyrod and press it into the hole. As the tube is inserted, it will drag the covering with it. Press the tube down until its edge is flush with the surface, and apply a drop of CA. The result is a neatly bushed hole. You could also use eyelets (available from a crafts store); they come in many colors, lengths and diameters.

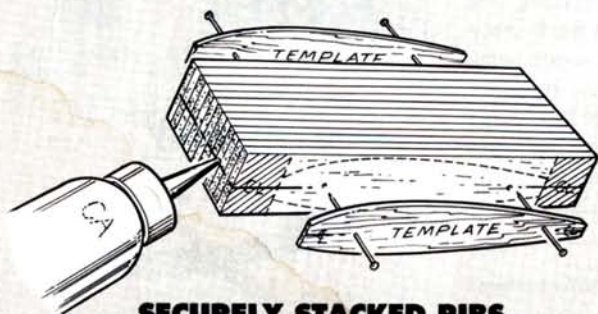
*Rich Hutchings, Rochester, NY*



## WHEEL-WELL LINERS

Cut an aluminum beverage can as shown, then scrub the outside with steel wool or 400-grit sandpaper to "key" the metal. Epoxy the can into place, and sand it to match the wing's contour.

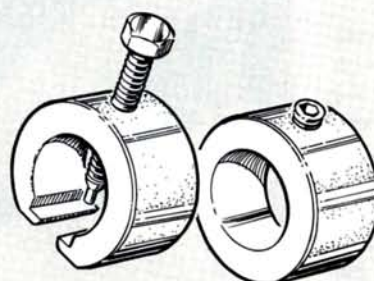
*Jose Claudio Villar, Curitiba, Brazil*



## SECURELY STACKED RIBS

Cut your rib blanks too long (shown shaded). Apply a little CA to the ends, so there's no chance that the blanks will skid out of alignment when you carve and sand them. Shape the block as usual, but leave the tabs on the end of the block until you've finished the shaping. Then use a razor saw to remove the glued tab carefully.

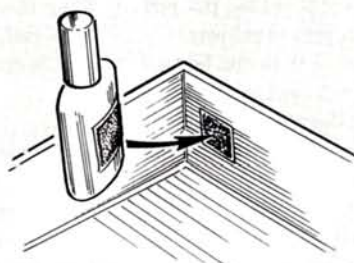
*Neil Reid, San Francisco, CA*



## SIMPLE GEAR PULLER

Buy a  $\frac{3}{4}$ -inch-i.d. shaft collar at your local hardware store. To make this useful tool, use a hacksaw and a file, and replace the regular setscrew with a longer bolt. It's handy to have if you do your own engine or motor work.

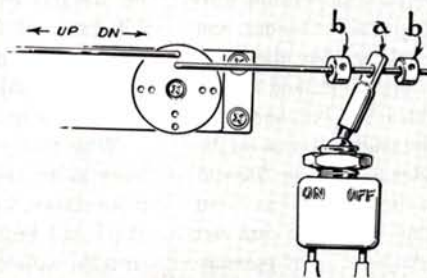
*Reuben Schneider, Phoenix, AZ*



## NO-SPILL CA BOTTLE

Attach a patch of adhesive-backed Velcro® to your CA bottle and one to the inside of your flight box. You can be sure that the CA bottle won't end up on its side, its contents emptied among your tools.

*Larry Renger, Cerritos, CA*



## ADD A CHANNEL

Heat a piece of small Nyrod (a), flatten its end with a pair of pliers, then force it over the switch lever. Drill a  $\frac{3}{32}$ -inch hole through it, then insert the extra pushrod, as shown. Add a couple of wheel collars (b), leaving plenty of space on each side of the lever. The extra pushrod can be attached to the elevator or rudder servo, the space between the collars allowing normal control movements without affecting the switch until full control movement is called for—then, it will operate the switch. This arrangement gives virtually 3-channel operation from only two channels. Note: the hole you drill must be larger than the pushrod wire to prevent jamming. You might have to move the pushrods' hole positions to adjust the pushrod's travel to operate the switch.

*Jonathan McFadzie, Gore, Southland, New Zealand*



by JEF RASKIN



### VACUUM BAGGING COMPOSITE WINGS

**Subject:** A how-to on vacuum bagging  
**Source:** Greco Technologies, Pasadena Financial Center, 35 North Lake Ave., 7th Floor, Pasadena, CA 91101; distributed by Aerospace Composite Products, P.O. Box 16621, Irvine, CA 92714.  
**Summary:** Useful, thorough.  
**List Price:** \$25 (plus S&H)  
**Approximate length:** 35 minutes

Vacuum bagging has become recognized as one of the best ways to make strong, light, well-finished parts for model planes. In this process a foam core is bonded to epoxy-impregnated fiberglass or carbon-fiber cloth by putting the assembly—while wet—into a plastic bag and using a vacuum pump to evacuate the air. The pressure of the surrounding atmosphere forces the covering material against the core. Smooth sheets of plastic impart a glass-like finish to the resultant product. Vacuum bagging can also be used to bond wood coverings to foam cores with equal precision and permanence.

The information in this video is comprehensive and authoritative. The tape, featuring George Spitzer and Greco Technologies products, wisely begins with safety precautions and then goes on to illustrate the fascinating, but surprisingly simple, technology of vacuum bagging. Details of how to handle problems, join wing panels, finish the parts and even how to repair composite structures are also discussed. The video comes with a 12-page manual that covers the same material. Having the information in two different forms can be very

handy; it's hard to flip through a video tape looking for a half-remembered detail, while no passive page can teach the overall process as well as the tape. I give Greco high marks for this extra effort. The few rough edits in the tape and typos in the text do not detract from their usefulness.

If you are jealous of the guys or gals who take airplanes out to the winch, slope, or runway with magnificent composite wings and tail surfaces with a finish that looks like poured glass, following the instructions in "Vacuum Bagging" will put you right in their league. It's good stuff, and aside from having the expert Mr. Spitzer by your side, this video is the best way I know to learn how to do vacuum bagging.



### LE GLAMOR DE LA FERTE ALAIS '91

**Subject:** The great Paris scale R/C meet  
**Source:** TS Video Productions, 107 Gold St., Wellingborough, Northants, NN8 4EQ England; distributed by Hobby Lobby Intl., 5614 Franklin Pike Cir., Brentwood, TN 37027.  
**Summary:** The best video on a scale meet yet.  
**List price:** \$24.95  
**Approximate length:** 60 minutes

"La Ferte Alais" is a major international scale model contest held annually near Paris, France. The models are often very large indeed, 1/2 or even 2/3 actual size! Don't be put off by the title if your French is rusty, since the tape is in English. Nonetheless, the script is presented with panache and the planes flown with élan. Additional depth is gained by the presentation of interesting technical details, as in the segment on the first commercially manufactured turbine jet engine for model use.

Very well produced (the best I've seen) and photographed with imagination and clarity, the tape is a delight to watch. The variety of airplanes being modeled is spectacular, from aerial pioneers to jets, with many subjects you don't often see in the U.S. More than the usual amount of attention has been paid to the soundtrack, and the engines can be heard in high fidelity.

(Continued on page 126)

## Sport Flyers Association 800-745-3597

4145 Travis, Ste.202, Dallas, TX 75204  
 Membership Application Fax 214-522-0868

### SAFETY CODE COMPLIANCE AND WAIVER STATEMENT

I will comply with the SFA Safety Code and my Flying Site Safety Code for all model aircraft operations and the NAR Safety Code(s) for all sport rocket operations including any changes or additions which may occur during my membership period. I understand that my failure to comply with the codes will result in loss of liability coverage for any damages or claim. I understand that written notice must be provided immediately upon the occurrence of any incident of bodily injury and/or property damage. I also understand that no claim will be accepted sixty (60) days after the expiration of my policy. I hold harmless the Sport Flyers Association, Incorporated trade membership organization for any personal injury, property damage or wrongful death which may occur. Current membership and coverage effective January 1, 1993 to December 31, 1993.

### MUST BE SIGNED BELOW FOR ACCEPTANCE

X

Applicant or Parent/Guardian of Applicant under sixteen years of age

### SPORT FLYERS ASSOCIATION SAFETY CODE

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- I will not fly my models in the presence of spectators until I have learned to fly safely.
- I will not use metal propellers.
- I will not buzz, tail or harass any aircraft, car, animal, or any object in the air or on the ground.
- I will test fly any new or repaired aircraft before flying in the presence of spectators.
- I will abide by all safety rules established at any field where I fly and any state or local regulations governing model flying. I will always obtain prior permission from property owners before flying. I will not fly any models in a careless, reckless or dangerous manner.
- I will not use hazardous fuels nor fuels containing tetranitromethane or hydrazine.
- I will not use any explosives in conjunction with model flying whether on the model, in the air, or on the ground. Rockets will be flown in accordance with the Safety Code(s) of the National Association of Rocketry. A fire extinguisher must be present when using pyrotechnic smoke candles. Authorization may be secured from the SFA for special events.
- I will not power my models with turbojet engines unless I have been certified to do so by the SFA, an SFA approved flight school, or an SFA approved manufacturer's program.
- I will not fly my model higher than 400 feet unless it is flown in uncontrolled airspace, or unless it is a sport rocket flown in accordance with the Safety Code(s) of the National Association of Rocketry.
- I will not fly my model aircraft within three miles of any airport unless I have received permission from the airport operator or authority, or I am flying at an authorized radio control flying site.
- I will always perform a ground check of my model before flight.
- I will use only those radio control frequencies currently allowed by the Federal Communication Commission.
- I will extinguish any fuses on my Free Flight model upon completion of function.
- I will only launch Free Flight models at least 100 feet downwind of spectators, cars, or anyone not directly involved with the flight.
- I understand that SFA insurance does not cover activities related to the flying of Control Line models.
- I will retrieve any lost model with great caution, considering all circumstances thoroughly before proceeding, and will never attempt to recover a model from a power line.
- I will not prop or adjust my model aircraft engine with an unprotected hand.
- The weight limit and size of my aircraft will be in accordance with the local and national rules of the FAA and/or the QSAA, and those rules which apply at clubs which have special SFA policies which exceed the coverages provided in the SFA Master Policy.

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## HIGH PERFORMANCE AT A LOW COST

*John Ihlein (left) and  
author prepare to fly  
the Alcyone.*



PHOTOS BY JIM SIMPSON & DAN PARSONS

**N**ORTHEAST SAILPLANE'S\* Alcyone, manufactured by Culpepper Models, was delivered to my house in a plain brown box. Just as we're told never to judge a book by its cover, so should we not judge a kit by its box! I opened one end of the carton and pulled out the contents: white foam wing-cores, good-looking balsa planking, many nice, straight sticks and an impressive bag of hardware with some unusual contents. The instruction manual, which included some black-and-white photos and drawings, appeared to have all that would be needed. The plans are clear, blue-line, full-size drawings.

The Alcyone's designer is Leroy Satterlee and he related in the introduction to the instructions that the plane is an oversize version of the Chuperosa, which won the 1991 2-meter Nationals. He further states, "The Alcyone is not a beginners' airplane, but can be built successfully by any competent modeler who has built two or three ships previously." I found it to be reasonably easy to assemble.

What about performance? The Alcyone is a high-performance, low-cost airplane that really flies well. I fly in a club that is soaring oriented—for several of us, the Alcyone has become a favorite. [Editor's note: a second version of the Alcyone that features a fiberglass fuselage is also available from Northeast Sailplane.]

# NORTHEAST SAILPLANE'S *Alcyone*

by JIM SIMPSON





## FLIGHT PERFORMANCE

*Our comments on this project are based on our experience and observation of two models of the Alcione. One, flown by John Ihlein, carried a JR\* PCM-10 radio and had the CG at the aft limit of the range. The other, flown by Taylor Collins and me, had an Airtronics\* Vision radio and the CG dead-on as shown on the plans. John placed very well with our club team in a recent four-team competition using his plane, and both Taylor and I have considerable experience with R/C sailplanes, including too much F3B time.*

### • Takeoff and landing

The plane with the aft CG is launched at a lower angle if flaps are not employed. On launch, both are spectacular with flaps set at 15 degrees. Climb angles are nearly vertical on release and both zoom magnificently. No heading corrections are required in any phase of the launch.

### • High-speed performance

In a word, wow! The Alcione is a clean design that accelerates rapidly when cleaned up for fast forward flight, i.e., with flaps slightly reflexed and enough down-elevator trim for a slight nose-down attitude.

We flew the Vision radio with an aileron differential of about 3 to 1 (up to down), and with aileron and rudder coupling such that about half the total rudder-control movement could be included with total movement of the aileron control stick—a good mix.

### • Low-speed performance

The Alcione should be heaved to prevent stalling should a "pop off" occur or, in the unlikely event that the towline should break on launch. The Alcione performs well in a slow cruise like at the point of release when using a high-start and not zooming, or when cruising around in an area with weak thermals. By playing with the camber (drooping the flaps and ailerons just a few degrees) performance gets even better.

Landings improve noticeably when flaps are deployed full-down until just before touchdown. Most impressive is the crow mode. The Vision-equipped version is set up to use flaps down to 90 degrees and ailerons up to 75 degrees. The effect is like having a drag chute. Such approaches are very slow and stable, but also require flap retraction just prior to touchdown.

Configuring aircraft to fly at minimum air speed without losing altitude can be most easily accomplished by adjusting the elevator trim (usually, slightly up) and lowering the flaps (and ailerons if computer radio equipped) 1 degree at a time.

Stall behavior is best described as quick and clean. In all cases so far, both airplanes drop the left wing, and recovery requires that you drop the nose to regain air speed (which also can be done quickly).

*[Editor's note: Sal DeFrancesco and Stan Eames, owners of Northeast Sailplane, have a reputation for honesty and candor when describing the performance characteristics of their products. They maintain that the novice should build the ship in its lightest form—with 3 servos—to emphasize the docile, slow-speed, yet high-performance characteristics of the Alcione. Jim Simpson, an experienced sailplane pilot, prefers a ship that is configured as noted.]*

### • Aerobatics

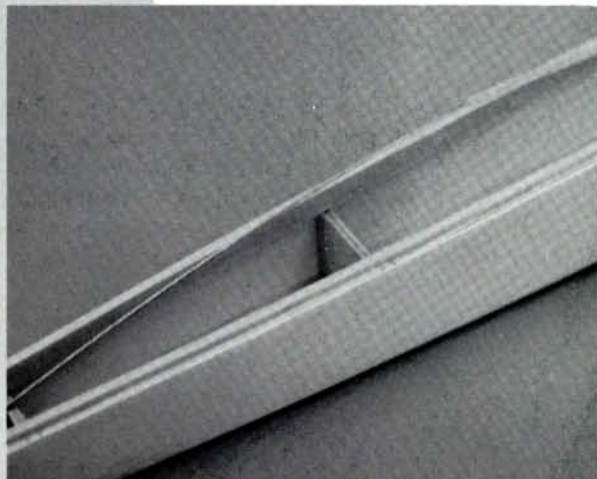
Every time I flew the Alcione, I did aerobatic maneuvers and had a ball! This plane does them very well. It loops with ease from high cruise-level flight and will do so consecutively without significant loss of altitude. Rolls are axial with the Vision-equipped version, because the aileron differential, rudder coupling and CG are closely matched. Inverted flight is rock stable and very impressive.

My impression of the durability of this model, given that it's a sailplane, is that it will last a competent, careful pilot indefinitely. One of our test models had a midair collision with a 2-meter plane that had a built-up wing. The Alcione wing sliced the other wing off clean at the dihedral break and when the Alcione landed, it was nearly impossible to tell where the impact point had been!

## CONSTRUCTION

The rudder is first to be built. I realized that the plywood doubler on the bottom edge of the rudder would need to be faired-in smoothly, so I used some lightweight spackle before sanding the assembly to shape.

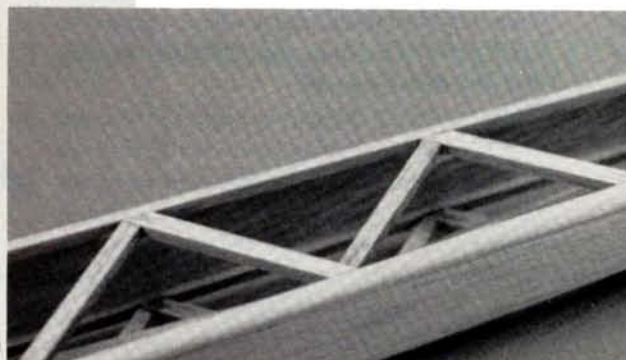
The fin is next, and the photo shows six holes in the balsa-core piece. Mine



*There is plenty of room for the radio in the Alcione's front end*

only had one hole, and that was for the 1/4-inch plywood disk for the main tail carry-through. The fit was perfect. I carved one more hole, and a channel, for the control-cable and its terminal. I should have cut the other holes as well, because with such a long tail moment, the weight saving would have slightly reduced the nose weight I later added. Better yet I wish Culpepper Models had just cut all six holes as they did the one.

Although my kit came with flex cables for primary control-surface actuation, I don't recommend them if you are seeking the last word in precise control. I did use them on the elevator because I wanted to review the kit as designed. Since my review kit was man-



*The aft end of the fuselage features sheet and truss construction.*



**My flap servo well. The outer face of the servo will be secured in place with transparent packaging tape.**

easy to sand, shape and fair into the rounded leading edge as balsa or ply. I used it on the kit I built, but my friend John Ihlein, who contemporaneously built an Alcyone, did not use it on his. His plane came out 9 ounces lighter, and this may partially account for this. [Editor's note: Northeast Sailplane uses this material because it imparts more strength for its weight than lite-ply.]

The fuselage is constructed with plenty of hardwood in front of the center of gravity (that's better than lots of added nose weight!) and it has a strong truss and sheet-tail section. I really like the box that is formed by the wing hold-down plate, the tow-hook mount and the side doublers. The basswood nose block is a nice touch as well. John and I did not use the hatch hold-down method as shown on the plans because if the rubber band breaks (and they do) you can lose the hatch.

The elevator built up quickly, strong and true. [Editor's note: since the review kit was released, Northeast Sailplane has replaced the built-up elevator with a foam-core elevator.]

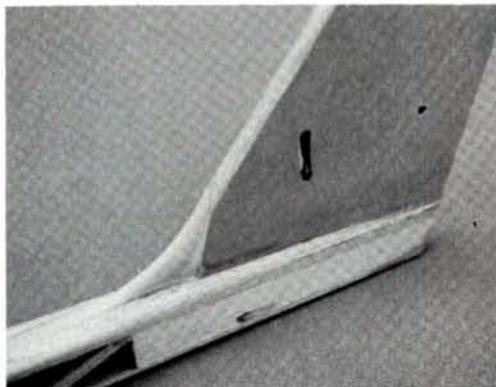
## WING

When building the ailerons, I opted to use a modification mentioned in the introduction that suggests mounting four servos in the wing. This allowed each surface to have a dedicated servo and permits the use of "crow mode"—a real plus for any sailplane that flies as well as the Alcyone. [Editor's note: Northeast Sailplane recommends use of the flex-cable system controlled by three good intermediate servos to save several ounces of weight. This is said to produce a more docile, slow-flying airplane, which may be desirable if you are a novice to intermediate pilot.]

An advantage of the standard building procedure using the flex cables is that the plane can then be flown with a four channel radio (part of the concept of the Alcyone was to create a high-performance plane that can be built and enjoyed without the need to invest in expensive, high-tech equipment). The instruction book says, "During part of the flap down-stroke, the R.H. flap gets slightly ahead

ufactured, Northeast Sailplane has replaced the flex-cable elevator-control system in the standard kit with a different, more efficient cable system that I understand takes care of some trimming problems associated with the original flex linkage. The glass fuselage version of the kit includes a bell crank assembly for the tightest linkage and best elevator control.

The fin core was covered with side sheets of a tough material that was cut to shape. It looks like cardboard, but it appears to be a kind of heavy hardwood, and it was not as



**The fin is shown. Fin and rudder assembly fair nicely into the fuselage.**

## INITIAL CONTROL-MOVEMENT SETTINGS

|                 |  |              |                |
|-----------------|--|--------------|----------------|
| <b>Ailerons</b> | high rate                                | 7/8 inch up  | 1/4 inch down  |
|                 | low rate                                 | 3/8 inch up  | 1/8 inch down  |
| <b>Flaps</b>    | reflex                                   | 3 degrees    | up             |
|                 | launch                                   | 15 degrees   | down           |
|                 | brakes                                   | 82 degrees   | down           |
| <b>Elevator</b> | high rate                                | 1/2 inch up  | 1/2 inch down  |
|                 | low rate                                 | 5/16 inch up | 5/16 inch down |
|                 | neutral                                  | + or -       | 1/16 inch      |
| <b>Rudder</b>   | Max deflection 2 inches either direction |              |                |
| <b>Rudder</b>   | + or - 2 inches                          |              |                |

**Alcyone nose features a basswood nose block; a large hatch permits access to the fuse interior.**

## SPECIFICATIONS

**Model name:** Alcyone  
**Manufacturer:** Culpepper Models  
**Type:** R/C sailplane  
**List price:** \$149.95  
**Wingspan:** 121 inches  
**Wing area:** 975 square inches  
**Wing loading:** 9.85 ounces/square foot  
**Weight:** 69 ounces (as tested)  
**Length:** 53 inches  
**No. channels req'd:** 3 (6 used in test)  
**Radio used:** Airtronics Vision  
**Airfoil type:** SD 7032/SD 7037  
**Washout:** Built-in, geometric and aerodynamic  
**Wing construction:** White foam-core, spruce/balsa spars, balsa-sheet covering with fiberglass reinforcement.  
**Kit construction:** Built-up balsa sheet reinforced with plywood and spruce. A higher-end kit with a fiberglass fuselage and bellcrank tail linkage is available for \$199.95.

**Optional accessories used:** include flaps and ailerons normal and "crow mode."

**Features:** well-done blue-line plan drawings, printed building and flying instructions, high-quality components and all necessary hardware.

## Hits:

- High performance—flies well, tows well.
- Low cost—well suited to the novice to intermediate level pilot, with performance potential on a budget for the experienced pilot.

- Fuselage construction light and strong.
- Excellent wing-mounting system; spar jig and building technique are outstanding.

## Misses:

- Fin and rudder sheet material, although strong, did not shape easily.
- Flexible cable system for elevator control led to trimming problems. (Northeast Sailplane now includes different cabling

in its standard kits to eliminate this problem.)

(Continued on page 126)

# HOW TO

# Make Smoke With Your G-62

by RICH URAVITCH

**S**O, YOU'VE got an entire season on your giant-size, Zenoah G-62-powered monster and you're looking to add a little something—nothing major like an airframe rework or a paint job; just something to add sparkle to your already masters-level flying skills...or, even better, to impress your club buddies at the upcoming fun fly.

When I decided to add a smoke system to my big SNJ, I chose the package offered by B&B Specialties\*. It includes everything except the smoke-liquid supply tank, the muffler and clear instructions, which are what I hope to present here.

The smoke-liquid container is a 12-ounce tank fitted with the standard "gas conversion" parts. Select the largest tank that you can stuff into the airplane because you'll probably find yourself using the smoke frequently, and the liquid passes through the

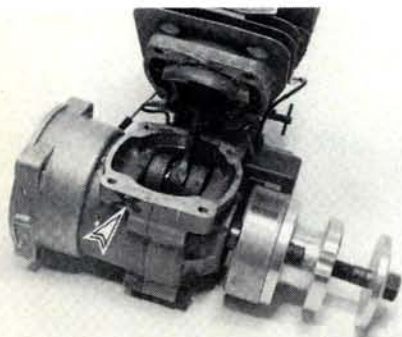
**WARNING!** The flight surgeon has determined that smoking can add to your fun!



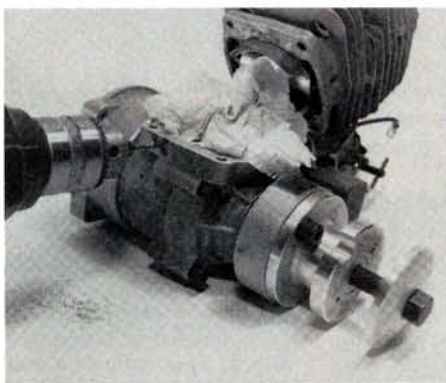
*My 101-inch-span SNJ-5C is smoke-equipped and never fails to excite spectators. Smoke adds a whole new visual dimension to R/C flying.*

muffler fairly rapidly. I built a scale exhaust manifold for my SNJ, but most mufflers will work. With my other smoke-equipped airplanes, I haven't found the use of a "smoker" muffler necessary. What I have found is that introducing more smoke liquid through a second tapped port on the muffler helps a lot! Enlarging the injection port is an alternative. The easiest way to determine the proper

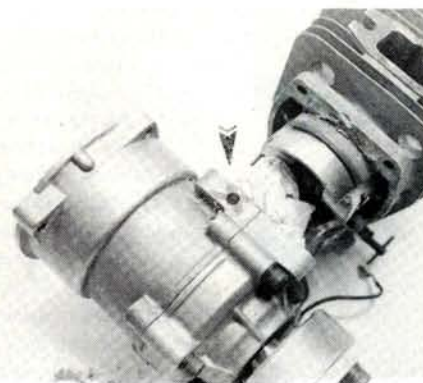
size is to operate the system and check the oil residue on the side of the fuselage. If the smoke is dense and easily visible but a lot of smoke liquid stays on the fuselage, you could probably reduce the size of the opening a little (or live with spending more time cleaning up the airplane). The most efficient size will yield good smoke while cutting down on liquid consumption.



**1.** To do the job right, remove the cylinder from the block. Rotating the crankshaft to position the piston at the top of its stroke will allow the piston to remain within the cylinder bore and eliminate the need to compress the rings on reinstallation. "X," indicated by arrow, shows where the hole will be drilled for the fitting.



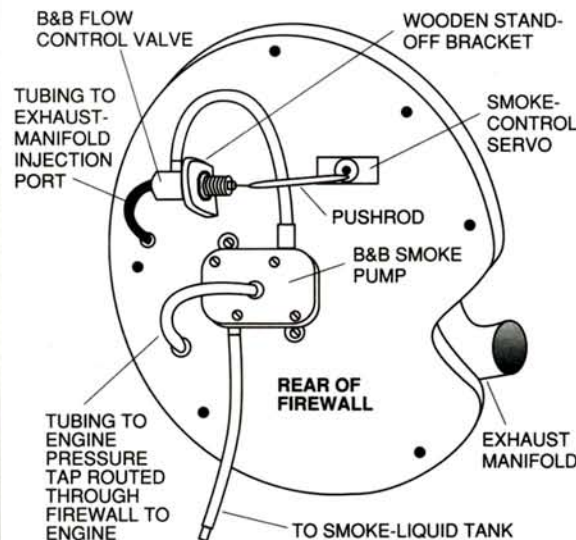
**2.** After you've center-punched the "X," drill a small (no. 43 bit) pilot hole completely through the crankcase. Before you drill, protect the inside of the engine from metal fragments by stuffing the cavity with paper towels or small rags.



**3.** Open the pilot hole with a no. 3 drill bit so that it can be tapped for the 1/4-28 pressure fitting. Note that the hole is centered vertically on the crankcase flange.

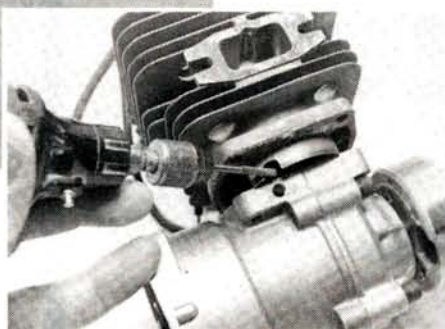
PHOTOS BY RICH URAVITCH

## SMOKE SYSTEM HARDWARE INSTALLATION

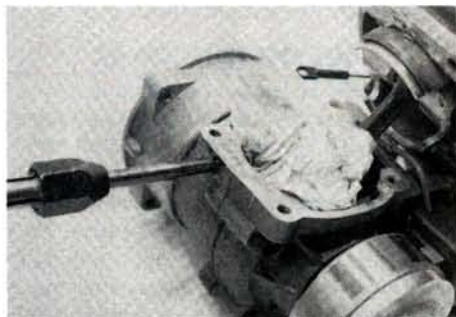


The procedure is easy and requires no special tools—not even a drill press. Just remember to proceed carefully and you'll soon be smokin' with no hazard to your health!

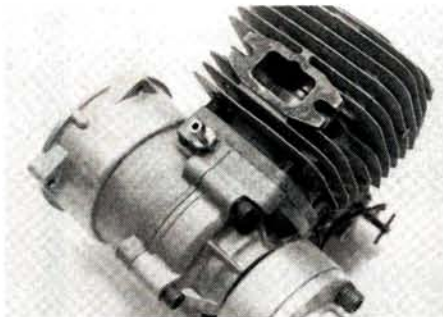
\*Here's the address of the company mentioned in this article:  
B&B Specialties, 14324 Cleveland Rd., Granger, IN 46530.



5. After the hole has been tapped, turn your attention to grinding away a small portion of the skirt. If you don't do this, the skirt will block the hole. A Dremel tool and a good, high-speed grinder bit will make short work of this task. Remove a little at a time. Temporarily replace the head and look through the hole; the passage should be clear with none of the skirt visible.



4. Carefully thread the hole with a 1/4-28 tap. Work it gently and lubricate with oil. As with any tapping procedure, don't try to go all the way through the material at once. Advance the tap until it feels tight, back it out, and advance it again. Rush this, and you could break the tap off inside the hole. Removing the broken tap is possible, but it sure isn't easy!



6. Apply a little high-temperature thread-locking compound to the threads, then install and tighten the fitting. Use some of the same compound on the crankcase flange when you reinstall the cylinder head. Rotate the crankshaft to verify that the port is clear and that the fitting is working. You should be able to hear and feel air being expelled through the fitting.

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| N-150N               | 1.2 | 150  | .453 1.122       | 1.50  |
| N-110AA              | 1.2 | 110  | .531 1.650       | 1.50  |
| N-270AA              | 1.2 | 270  | .531 1.651       | 2.50  |
| N-600AA              | 1.2 | 600  | .543 1.945       | 1.50  |
| N-500A               | 1.2 | 500  | .650 1.094       | 1.50  |
| N-650SC              | 1.2 | 650  | .866 1.010       | 3.00  |
| N-1100C              | 1.2 | 1100 | .992 1.173       | 3.00  |
| <b>KR SERIES</b>     |     |      |                  |       |
| KR-1300SC            | 1.2 | 1300 | .866 1.654       | 2.50  |
| KR-2000C             | 1.2 | 2000 | .992 1.929       | 4.00  |
| KR-4400D             | 1.2 | 4400 | 1.272 2.362      | 7.00  |
| KR-7000F             | 1.2 | 7000 | 1.272 3.543      | 15.00 |
| <b>HIGH CAPACITY</b> |     |      |                  |       |
| N-750AAE             | 1.2 | 750  | .543 1.945       | 2.00  |
| N-225AE              | 1.2 | 225  | .650 .642        | 2.50  |
| KR-600AE             | 1.2 | 600  | .650 1.094       | 2.50  |
| KR-1000AE(L)         | 1.2 | 1000 | .650 1.654       | 3.00  |
| KR-1200AE            | 1.2 | 1200 | .650 1.909       | 3.00  |
| KR-1700SCE           | 1.2 | 1700 | .866 1.654       | 3.75  |
| KR-2400CE            | 1.2 | 2400 | .992 1.929       | 4.50  |
| KR-5000DE            | 1.2 | 5000 | 1.272 2.362      | 10.00 |
| <b>FAST CHARGE</b>   |     |      |                  |       |
| N-800AR              | 1.2 | 800  | .642 1.909       | 3.00  |
| N-600SCR             | 1.2 | 600  | .866 1.016       | 3.25  |
| N-1000SCR            | 1.2 | 900  | .866 1.299       | 3.50  |
| N-1400SCR            | 1.2 | 1400 | .866 1.654       | 3.50  |
| N-1500SCR            | 1.2 | 1500 | .866 1.929       | 4.50  |
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| N-4000DR             | 1.2 | 4000 | 1.272 2.362      | 10.00 |

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| 4N-200AAA   | 4.8 | 200  | FLAT/SQUARE | 8.95  |
| 4N-110AA    | 4.8 | 110  | FLAT/SQUARE | 8.95  |
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| 4N-500A     | 4.8 | 500  | FLAT        | 9.95  |
| 4N-600AE    | 4.8 | 600  | FLAT        | 10.95 |
| 4N-800AR    | 4.8 | 800  | FLAT/SQUARE | 12.00 |
| 4KR-1000AE  | 4.8 | 1000 | FLAT/SQUARE | 15.00 |
| 4KR-1200AE  | 4.8 | 1200 | FLAT/SQUARE | 16.00 |
| 4N-650SC    | 4.8 | 650  | SQUARE      | 14.00 |
| 4N-1000SCR  | 4.8 | 1000 | FLAT/SQUARE | 16.00 |
| 4KR-1300SC  | 4.8 | 1300 | FLAT/SQUARE | 12.00 |
| 4N-1400SCR  | 4.8 | 1400 | FLAT/SQUARE | 16.00 |
| 4KR-1700SCE | 4.8 | 1700 | FLAT/SQUARE | 18.00 |
| 4KR-2000C   | 4.8 | 2000 | FLAT/SQUARE | 20.00 |
| 4KR-2400CE  | 4.8 | 2400 | FLAT/SQUARE | 22.00 |
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| 5N-150N     | 6.0 | 150  | FLAT        | 12.00 |
| 5N-110AA    | 6.0 | 110  | FLAT        | 12.00 |
| 5N-270AA    | 6.0 | 270  | FLAT        | 12.00 |
| 5N-600AA    | 6.0 | 600  | FLAT        | 10.00 |
| 5N-750AAE   | 6.0 | 750  | FLAT        | 12.50 |
| 5N-500A     | 6.0 | 500  | FLAT        | 12.50 |
| 5N-600AE    | 6.0 | 600  | FLAT        | 15.00 |
| 5N-800AR    | 6.0 | 800  | FLAT        | 15.00 |
| 5KR-1200AE  | 6.0 | 1200 | FLAT        | 19.00 |
| 5KR-1300SC  | 6.0 | 1300 | FLAT        | 15.00 |
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| 6N-1400SCR  | 7.2 | 1400 | FLAT | 22.00 |
| 7N-1400SCR  | 8.4 | 1400 | FLAT | 25.00 |
| 6KR-1700SCE | 7.2 | 1700 | FLAT | 28.00 |
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## STARSHIP

(Continued from page 40)

cause an over-rotation on takeoff. One engine still wasn't quite the way we would have liked, so we fiddled with it. *Bang!* Things got really loud. Another muffler cap had blown off. Damn! Without the pressure, the three-tank fuel system won't allow the starboard engine to develop anything over 10,000rpm. We had to fix it! Off we went to Dan's house amid a lot of good-natured ribbing from our club mates. It was 1 p.m.

Armed with a bottle cap, a 4-40 bolt and high-temp silicone compound, we made a quick fix to the troublesome muffler. So much for the guys who sell aluminum welding rods at the swap shops!

We were back by 1:30 p.m., and the Starship's existence was down to a matter of hours, although none of us knew it. Yeah, we knew this could be the only flight, and a really, really short one, too, but we had no idea what was to come.

Cameras were rolling, engines were screaming in perfect sync, and down the runway it came, gathering speed all the way. Up went the nose; *it was airborne!* The attitude was too steep, so Ray corrected and it yawed left. Ray corrected again. The Starship clawed its way up in a climbing right turn. It was flying; it was fast; and it was "beoooteful"!

As it leveled out downwind at about 150 feet, Ray did some trimming and remarked that it was a handful to turn. Although nobody said anything, I was struck by the very different look it presented in the air—a unique aircraft. Ray gently rolled it into a shallow 180 and directed it upwind; all the while, we heard the very distinctive synchronous sound made only by twin engines.

Another turn and it headed toward us, overhead now and away again. Ray guided it through a huge sweeping 270-degree arc around the field. He brought it overhead again, and the sky was filled with the sleek white shape and noise.

A couple of small reversing turns and a 180 to set up for a low pass down the runway and, as it came abreast of us, the starboard engine quit. Oh, boy!

## THE STRUGGLE BEGINS

Keep in mind that our field is ringed by 50- to 80-foot trees on two sides and 30-foot-high power lines on the other two. It's a real challenge *all* the time.

Ray nursed the plane through another 180 into a long upwind leg just over the trees. The Starship was holding altitude, but it wouldn't gain. Things looked OK as it teased the tree-tops. No one said a word; all we heard was the sound of one lone engine working like crazy. Ray eased it into the base leg to set up for a downwind landing. He turned final and...well, none of us saw it, but he was 5 feet too low.

(Continued on page 110)

# M.A.T. EXTRA



# 300

by GEORGE JENKINS

**M**Y INTRODUCTION to the Extra 300 was at the IMS Hobby Show in Orlando, FL, in May 1992. As I passed by Model Aviation Technology's\* (MAT) booth, its new 1/3-scale Extra 300 jumped right out at me. I went over to meet MAT owners Tom and Marilyn Gruenebaum, who had just returned from Germany with the first imported kit.

The immaculately molded, white, gel-coated fuselage hanging on the back curtain of their booth had really caught my eye. On closer inspection, I couldn't find any flaws or pinholes anywhere in the fuselage! I liked the roundness and fullness of the fuselage, too, since the Extra models I had seen before



## K · I · N · G   A · E · R · O · B · A · T

had much flatter sides and thinner fuselages. This looked like the full-size Extra I had seen at the EAA Sun and Fun Fly-In held in Lakeland, FL, just a few weeks earlier.

I opened the box and looked at the pre-built foam, fiberglass and balsa-skinned wings, stabilizer and rudder. There sure

wasn't very much to do to get this bird in the air. Then, I asked Tom Gruenebaum, "But how does it fly?" "Well," he said, "It flew and placed in the TOC in Las Vegas," ['89 and '92] Tom told me that each modeler who purchases an Extra 300 is assigned a certified owner's number, since only a limited



Clark Hopkins' Extra 300 (left) and George Jenkins' Extra show off in the Florida sun.

## FLIGHT PERFORMANCE

### • Takeoff and landing

**Jenkins:** The model was balanced with just a slight nose-down attitude. Corvin Miller took the sticks. There was water on the field in various places (we had just had record rains), and the grass was a little high. However, it didn't seem to make a difference to this big 300. The Extra passed the taxi test with flying colors, and full throttle was given. With the large fin and rudder, only a slight amount of rudder is needed to keep this big bird going straight down the runway for takeoff. The plane leaped off the field in about 75 feet and was airborne. The takeoff requires just slight back pressure on the stick, and the climb-out is smooth and very scale-like. A little up-tilt was required on the first flight.

On the second flight, Corvin made a scale-like easy climb-out and cut back to one-half throttle. He then proceeded to put it through its paces. "All you have to do is just point it, and it will do it," said Miller. "This plane is easy to fly and looks great doing it."

I couldn't stand it any longer and took the controls. This plane easily flew all of the maneuvers I was capable of, and made me feel like a pro. I was impressed by the constant slow speed of the maneuvers and how much they looked like the real thing with just half throttle.

Landings are almost as if there is an automatic pilot on board: the plane sets up well—a big plus. The laminated fiberglass landing gear handles the weight and G-forces of landing with ease, outperforming, in my opinion, similar aluminum gear I have used. Side slips are easy to set up, and recovery response is quick right before touchdown owing to the large, effective rudder and power of the G-62. Once you get the idle speed set on the engine, it's simple to set up for a landing. Landing at the slowest speeds will not cause even an induced stall.

**Hopkins:** With the engine at idle and the plane turned to the base leg, I discovered that the airplane was not slowing down even at idle. Previous scale ships have often had the glide ratio of a rock—not so with the Extra 300, which is very clean. I added full power and went around. The next approach I set up on final way out. With a 10 to 15mph crosswind rolling over the trees, there was little headwind to slow my airspeed.

### • High-speed performance

**Jenkins:** Since this is such a big airplane, speed is not as important as power. Scale-like speed is best achieved with one-half to three-quarter throttle setting. The G-62 just pulls it right on through without any loss in flight speed!

**Hopkins:** High-speed handling is crisp with no trim changes at any throttle setting. The roll rate is awesome with very little aileron deflection. Full and half-power pylon turns show no tendency to snap out. (Should your airplane snap in this test, reduce elevator throw until it tracks straight through the turn.)

### • Low-speed performance

**Jenkins:** A gentle flier at low speeds, the Extra has a very predictable sink rate. As soon as you turn final and come back on power, it sets up for a perfect three-point landing. The slow speed flybys and induced low-speed stalls did not produce a tip stall to the left or right. It fell straight forward and recovered beautifully. Power on stalls just fell forward through the center, and recovery was normal without going into a spin. We had one dead-stick landing because the engine idle was too low, but there was plenty of glide time to return to the field (just keep your flight speed up).

**Hopkins:** No matter what speed is chosen, this airplane seems to have no bad habits. Even at idle and full-elevator deflection, no tip stall became evident until airspeed reached zero. The airplane just stalls straight ahead and then flies on.

### • Aerobatics

**Jenkins:** The Extra gives you time to think. Small corrections are all that is necessary. Just point it in the direction you want it to go, and it goes there with only slight control movement. The extra large rudder helps on those four-point rolls, sustained knife-edge flight and stall turns.

Corvin took the transmitter and proceeded to do an FAI top hat, a four-point roll, an inverted flat spin and a field-length knife-edge. The control response was incredible, and crosswinds didn't seem to matter. The best way to describe its flight characteristics is as a "gentle giant."

There is plenty of rudder for stall turns and hammerheads as well as sustained knife-edge maneuvers. Spin recovery was straightforward. This Extra will outfly any of the Extras I've seen or judged during the last five years.

**Hopkins:** Inverted low passes with smoke on are one of my favorite maneuvers. This requires very little elevator input for level flight. Outside loops are no problem; just push! For a slow roll, I use about half of the available rudder, but very little elevator input is required.

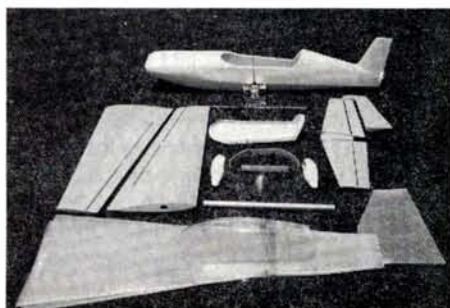
For a knife-edge that is as straight as an arrow, use full rudder and some down-elevator to maintain heading. Spin recovery is immediate; just release the controls and pull the elevator back slightly. No opposite rudder is necessary for recovery. I found that the Extra performed avalanches, hammerhead stalls, Cuban-8s and other maneuvers with ease. I have built approximately 50 different aerobatic airplanes, including Pitts, Christen Eagles, Lasers and Extras, and this Extra 300 tops them all.

To me, this airplane looks and performs exactly like its full-size counterpart, with a constant speed through all maneuvers. There is no aerobatic maneuver that this airplane can't perform, given enough horsepower. I now have the perfect contest machine.

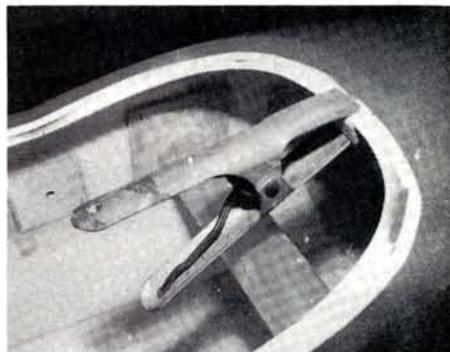
number of kits will be imported to the States. Being a dyed-in-the-wool scale builder, I really wanted to build this one.

### THE BASIC KIT

All of the parts in the Extra 300 kit, plus all of the accessories, the engine tanks and the prop I intended to use weighed 25½ pounds on a digital scale. I placed the fuselage on my PVC building stand and started reading the photo-illustrated instruction manual. All hardware, including wheels and spinners, is included. You'll need a Zenoah G-62 engine, (ours was provided by Indy R/C\*), a Slimline\* no. 2100 Pitts smoker muffler and smoke pump. If you plan to use plastic film



Shown are the pre-built parts; the Futaba radio gives an idea of the size of the kit.



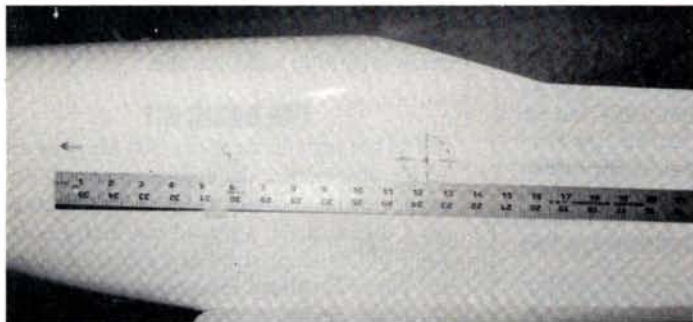
Plywood pieces are used to reinforce the structure that holds the aluminum wing tube, and for wing mounting nuts. The clamp holds a block of wood that will be used for the mounting screw.

covering or Zap\* Z-poxy finishing resin, cloth and paint, you'll need to purchase these as well.

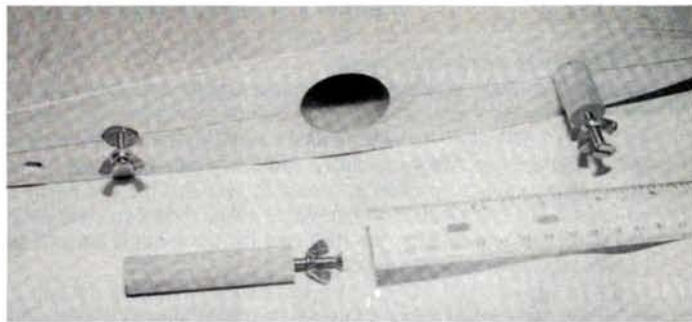
This is not a beginner's kit. To build this, you should have a number of planes under your belt and be out of the trainer stage and into advanced flight maneuvers. Its lightly built fuselage would not withstand much horsing around, e.g., hitting the ground hard.

### CONSTRUCTION

I found the fuselage to be flexible and strong. The gelcoat didn't crack or split even after repeated handling. I used a Du-Bro fiber cutting wheel (it cuts like a knife through butter, but it doesn't leave fibers) to make the cuts for the motor and also a drum sanding tool mounted to the flex shaft of my Dremel tool.



You must get the wing and stab alignment correct—a grease pencil helps, and measure from the tail.



The wing mounting system is simple, strong and easy to use. Precut hole near rear wing mounting bolt is for the servo extension wire.

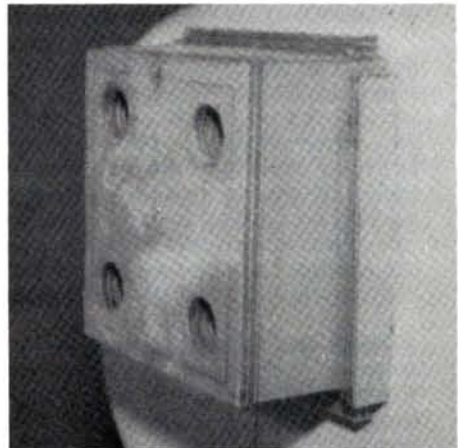
The foam and fiberglass reinforcement along the fuselage sides was strong, light and added an appropriate amount of stiffness to the plane.

Particular attention should be paid to the alignment instructions for the engine side-thrust. (Eliminate any downthrust as flight testing has shown this does not enhance performance.). Also, the wings and stab must be square and level to the thrust line to ensure that you have a true flying 300. Use the recommended motor or one that's larger; don't use a smaller one.

I installed a Futaba\* 7UAPS PCM 1024

radio, 1/4-scale servos and 9201 double ball-bearing servos. If you use only basic FM equipment, I suggest that you use an RF choke in the aileron and elevator extension leads because of their length. I also recommend the use of a three-blade carbon-fiber prop from Eric's Quality RC Products\* for your size of engine. The prop noise is greatly reduced, and there's no tip flex with these stiff props, not to mention the nice scale appearance.

I found only one change in materials that I would recommend. Rather than the 1/16-inch plywood, I would use slightly thicker



A trial-fitting of the Zenoah G-62 with Slimline Pitts-style muffler required an engine extension as well as an after-market extension to the engine itself to ensure clearance of the front of the cowl.

## SPECIFICATIONS

**Model name:** MAT Extra 300

**Type:** TOC level, 1/3-scale aerobatic ship

**Price:** \$1,600

**Wingspan:** 92 3/4 inches

**Length:** 82 inches

**Wing area:** approx. 1,500 square inches

**Wing loading:** 39.2 ounces per square foot

**Weight:** 20 to 27 pounds (depending on extent of scale fittings)

**Engine used:** Zenoah G-62

**Prop used:** Eric Dern, 20x11 3/4, three-blade carbon fiber

**No of channels required:** 5 (rudder, elevator, throttle, ailerons, smoke)

**Airfoil type:** semisymmetrical

**Wing construction:** foam core, sheeted with balsa and glassed

**Kit construction:** gelcoated fiberglass with balsa, foam and plywood

**Features:** One-piece gelcoated fiberglass fuselage and vertical stab, factory-sheeted fiberglass-reinforced foam wings and stabs.

Laminated fiberglass landing gear with wheel pants and all hardware, including wheels, spinner, axles, tail-wheel assembly fuel tanks and servo doubler. Transportation covers are included; tanks are not.

**Hits:**

**Jenkins—**

- Extensive prefabrication
- Exceptionally gentle, yet capable of competition level aerobatic performance

**Hopkins—**

- Well manufactured kit with beautiful scale appearance
- Excellent aerobatic capabilities

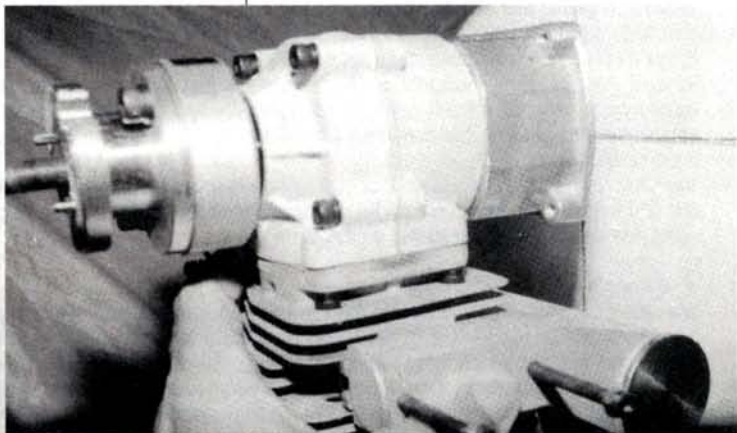
**Misses:**

**Jenkins—**

- Slightly thicker plywood on the end caps of the wing and stab tips should be supplied.
- Downthrust should be eliminated.

**Hopkins—**

- Canopy had imperfections that required polishing out.
- Downthrust and right thrust are built into the fuselage, but downthrust should be eliminated or porpoising will occur.



plywood on the endcaps of the wing and stab tips. After final sanding, they were mighty thin. To strengthen this area, you might want to CA another piece of 1/32-inch ply.

I also recommend the use of Zap epoxy mixed with an appropriate lightweight filler for the strongest possible bonding to the fuselage sides. Use Zap CA that's compatible with foam.

## FINISHING

After about 35 hours of work, the Extra was ready to finish, and that took me only three

# READER REPORT

by CLARK HOPKINS

I've been flying R/C airplanes for 10 years and have been involved in scale competition, fun scale and sportsman classes with 1/4-scale aircraft for five years. I wanted a larger version of the Extra 300, and after seeing the 1/3-scale model Model Aviation Technology kit advertised in *Model Airplane News*, I contacted the company and flew the prototype kit at a fly-in in Markham Park in Broward County, FL. The aircraft won Best of Show out of 81 aircraft entered.

I decided to build a kit for scale competition, and with the Scale Masters just two months away, and the last qualifier, the Key Lime Classic, coming up a week earlier, I had my work cut out.

## CONSTRUCTION

I'm an experienced builder, so I found the kit very easy to build and had no problems with the alignment of the wing and tail surfaces. (Even though the manual hadn't been completed at that time; it now includes many pages with photographs and templates.) The wing and horizontal stab come marked with 1/16-inch holes in the left side of the fuselage. This requires that the builder transfer the measurements to the right side—the only critical part of the construction. Measure carefully from the tail when you do this, because right thrust is built into the fuselage front.

The engine box should be installed with right thrust but no downthrust. Wings and stabs, which have aluminum spars, are removable and are pinned with one screw per panel. All the tubes in the wings and stabs have been installed at the factory.

The reinforced foam fuselage requires no formers, but only a plywood firewall and a balsa tail post. This leaves ample room for radio equipment, smoke system, etc. With all the equipment installed, my plane required no additional weight for balancing. I do recommend that you use only one 1/4-scale servo with a pull/pull system for rudder control.

When you install the instrument panels and pilot, make sure the cockpit is well vented. The canopy I received with my kit had a number of imperfections, but some toothpaste and elbow grease seemed to help this situation. Anyway, the canopy now smells minty fresh.

My plane is powered by a Zenoah G-62. I chose a Slimline giant-scale smoke muffler

with coil, with a B&B smoke pump and valve that operates off crankcase pressure. The exhaust system had to be extended about 6 inches for scale appearance—no problem. I used 90-degree and 45-degree 5/8-inch-diameter copper elbows with silver solder on the joints. The exhaust system is isolated from the muffler by an automotive heater hose and clamps. Rubber mounts isolate the engine from the firewall. An Eric Dern three-blade carbon-fiber prop and spun-aluminum spinner add the finishing touches.

## FINISHING

For the wing and empennage, I chose 1/2-ounce glass cloth with Z-Poxy finishing resin. I applied the cloth directly to the balsa with spray adhesive. (do not breathe these vapors; wear a cartridge filter mask) and trimmed it. Two coats of resin were applied and squeegeed off, followed by a coat of automotive primer and the final coat of Amerflint paint. I scuffed the fuselage with 320-grit sandpaper to remove the mold-release agent and then wiped it clean with a solvent. I used auto primer and 3M fine-line tape to create the panel lines, and added rivets with RC-56 glue followed by silver dope. I used Amerflint paint on the fuselage.

## COMPETITION

I logged four flights the first day out, and everything worked perfectly. The next week was devoted to finishing the scale details, and I entered the last qualifier for the Scale Masters one week later. I spent only seven weeks, or 300 hours, on the plane from kit to contest. I received first place in the Expert Class at the Key Lime Classic in Florida and the honor of flying at the '92 Scale Masters in Irving, TX. My results there were 94 points in Static and a total of 177 points, which placed me 13th overall. I enjoyed this very much. There's nothing like being able to wring it out with 50 of the best pilots in the U.S.

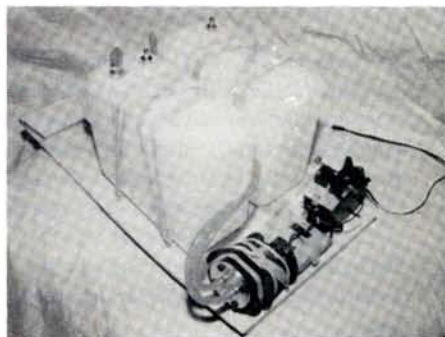
The MAT Extra 300 is a gentle giant that requires only intermediate flying skills. It performs just as well off grass or pavement. From the time power is applied on takeoff to roll-out after landing, this airplane performs flawlessly. This kit is a little on the expensive side with an approximate full project cost of \$3,500, but it was worth every penny (suggested retail price: \$1,600).



Clark Hopkins with his MAT Extra 300.

weekends. I decided to paint the fuselage and to use Great Planes\* pink and white MonoKote and green Ultracote cut into shaped pieces for the wing, stab and rudder. The idea was to match the unusual paint scheme I had copied from photographs of the Extra 300 prototype on display at a German trade show.

Unless you are going to use stick-on graphics, you will have to wet-sand the fuselage. The gel-coating is so slick, paint will not adhere well otherwise! A primer and a



Removable tank tray has gas and smoke tanks, smoke fluid pump, battery pack and servo/micro switch. The tanks are mounted under the wing tube at the CG.

fine dust coat of paint should be applied before the final cover coat. I would like to thank scale master Corvin Miller for his painting assistance and for helping to test-fly the Extra for this review.

In summary, this aircraft is a well-designed, exceptional performer that combines the benefits of large model aircraft



The scale Rocket City horn is used with a Futaba 1/4-scale servo for elevator control. Steering is by a pull-pull system using Du-Bro 4-40 ball mounts. A scale Sig tail-wheel assembly is used with a 1 1/2-inch Du-Bro tail wheel.

with those of a proven aerobatic design. This Extra would make a fine trainer for those wishing to improve their aerobatic proficiency. Whether you decide to use the plane for scale, pattern, IMAA fun flys or as a good Sunday flier, the Extra 300 will fill the bill.

\*Here are the addresses of the companies mentioned in this article:

Model Aviation Technology, 12848 Touchstone Place, Palm Beach Gardens, FL 33418.

Indy R/C, P.O. Box 40116, Indianapolis, IN 46240.

Slimline Mfg., P.O. Box 3295, Scottsdale, AZ 85257.

ZAP; distributed by Frank Tiano Enterprises, 15300 Estancia Ln., W. Palm Beach, FL 33414.

Futaba Corp. of America, 4 Studebaker, Irvine, CA 92718.

Eric's Quality R/C Products, 1602 White Dove Dr., Winter Springs, FL 32708.

Great Planes Model Distributors, P.O. Box 9021, Champaign, IL 61826.

# SIMPLE PROGRAMMING

DAVID C. BARON



## MORE ON THE JR X-347

IN THIS ISSUE, we'll wrap up the discussion of the JR X-347 radio ACRO functions and how they can be programmed for competition fun-fly ships. In case you haven't seen the last two issues, I provided an overview of competition fun-fly mixing and a discussion of the Futaba 7UAPS radio in the December issue, and part one of a discussion of the X-347 in the January issue.

### SETTING LANDING ATTITUDE AND AUTOMATIC LANDING SYSTEM

• **LD—landing attitude.** This function gives us automatic spoilers at a preset position of the throttle stick. Owing to the limited information in the transmitter display, use of this function may seem a little awkward, but be assured that between my description and the manual's directions (pages 18 to 20), you'll easily achieve this useful mix.

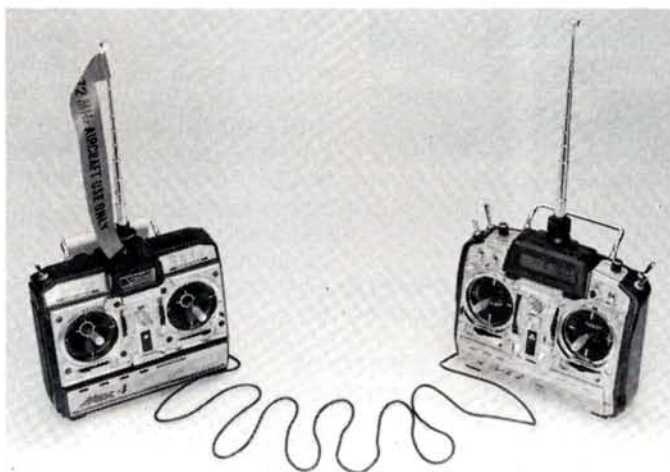
In fun-fly aircraft, the ailerons on each wing do triple duty as ailerons, spoilers and flaps. Don't be concerned that the spoiler channel is AUX 3 and no servos are plugged into that port. Think of the spoilers as flaps that are merely going in the wrong direction, and be assured that everything is hooked up correctly.

As you scroll through the LD (landing attitude) function with the "CH>" (channel key), you should see the following:

• **LD:E—elevator-value setting.** This "re-trims" the aircraft for any tendency to pitch up or down during spoiler (or flap) deployment. When you make changes with the "+" or "-" keys, you'll notice that the letter "U" or "D" appears to establish the direction (up or down) in which you've made the change. The number on the far right of the display represents the value of the amount of throw you have specified. This

amount can be from 0 to 125. Leave it at "0" for now because you'll adjust this after you've seen whether the aircraft exhibits a tendency to pitch up or down when the spoilers are deployed.

• **LD:F—flap-value setting.** This value will cause both ailerons to deflect up, i.e., it results in spoiler actuation (remember that they're just flaps going in the wrong direction). A "+" will raise them, and a "U" will appear in the display to remind you which direction you're going. Make sure that your flap knob (top left on your transmitter) is in the "0" position. If necessary, re-center



*The X-347 features an advanced trainer system that permits the student to be trained on one or more channels at a time.*

the output arms of the servos equal to neutral on the wing. This way, you're assured of equal aileron travel up and down, and of adequate throw for the spoilers.

• **LD:S—coupled-spoiler setting.** This is for situations in which you have spoilers on the wing in addition to flaps and ailerons. Unless you're building a scale Mitsubishi MU-2, I doubt that you'll need this part of this function any time soon. My apologies to you glider pilots out there who feel that this is actually a fairly common mix; you guys wrote the book on programmable radios, so I doubt that I can teach you many new tricks!

• **ATLD—automatic landing attitude setting.** This is the jewel, folks! Put the throttle stick in the position at which you wish the spoilers to actuate, and press either the "+" or the "-" data key. Now, spoiler actuation is set. When the stick is pulled to this position, up they go. On fun-fly competition ships, I set this at *full back*, i.e., at zero throttle; you have to tug slightly on the stick to extend spoilers. You'll be rewarded with automatic spoiler deployment. If it doesn't work instantly, check to see that your flap mixing switch is in the "down" (landing mode) position.

• **SNP.R—instant snap roll switch.** To date, snap rolls have not been a required maneuver in fun-fly competition. For sport and pattern aircraft, it presents the opportunity to snap inside or outside and left or right, with the ability to control the amount of throw on each control surface.

• **MIX DIFF—differential ailerons.** Differential allows you to achieve a perfectly true roll. It takes some experimenting; all aircraft are unique. A fun-fly plane should have a roll that's perfectly axial. Massive deflection alone is not the secret to a fast roll rate. Any wobble in the roll has a cata-

strophic effect on roll speed.

In scale applications, differential is used to create turns that do not induce any adverse yaw or the tendency to skid in the wrong direction when entering a simple aileron turn. This lessens the pilot's need to coordinate the turn with rudder.

• **MIX A—programmable mixing.** This is the first of the three flexible, programmable mixes. I call them flexible because you can direct any of the seven channels to interact with any of the others. This is where we turn on the Elevator/Flap coupling.

The first display that you'll see when you enter this mode is "MIX A11.+0%." This



Editor Tom Atwood (left) uses an X-347 at the Kingston fun fly. Columnist David Baron assists.

display tells us that "MIX A" is currently selected, and the first numeral designates the master channel 1 (throttle). The second numeral designates the slave channel (here, channel 1). The "+" sign designates the master channel's operating direction; "0%" represents the amount of throw that's being asked of the slave channel by the master.

• **MIX A1-1 0—offset-value setting.** For fun-fly, we won't use this feature. Briefly stated, it has the ability to set the point on the master channel's range of throw where the slave channel will be at neutral. In most of our mixes, the master and the slave share the same neutral, such as in elevator flap mixing. We don't want the flaps to be at 50 degrees when the elevator is at neutral.

An example of offset mixing is the spoilers that we have "slaved" to our throttle. It would be awkward if they deployed at the halfway point on the throttle stick! We want them only to deploy at idle—the extreme low end of stick deflection.

• **MIX A CH1-1.** This is where we'll establish which channel is the master and which is the slave. Pressing the "+" DATA key will advance the master channel. Press it twice to arrive at "3" (elevator). If you overshoot, continue to press the same key, and it will go up to "7," and then start over at "1." Next, press the "-" key to set the slave channel. This will be channel 6 (flaps).

Pressing the "CH>" key again will take you to the Operational Switch Setting mode. This is where you need to decide whether you want the elevator/flap coupling to be always "on" or switchable by either the: 1) mixing switch, 2) landing switch, or 3) elevator/flap switch. It's my choice to have them permanently on, and once you get used to flying with full-time coupled flaps, I think that you'll be using them full time on all your planes, not just fun-fly birds.

Scrolling with the "+" key to the "on" position will establish this mix as "on" full time.

Pressing the "CH>" key again will take you back to the first display, only now the numbers 3 and 6 appear to show what we have assigned as the master and slave channels, i.e., MIX A CH 3-6. Notice that moving the elevator stick on the transmitter changes the "+" to "-" in the display. While holding the elevator stick all the way back, press the "+" data key, and the flaps will start to move. They should go in a direction that's opposite that of the elevator, and if they don't, then use the "-" data key to accomplish this feat. Give yourself approximately half as much travel in the flaps as in the elevator; don't get carried away with big deflections, because the flaps will begin to create more drag than lift. Next, you need to hold the elevator stick in the full "down"

position to set the deflection.

• **MIX B&C.** These two mixes are basically clones of "A," so it's up to you now to think up creative mixes for them.

• **MIX D.** This mix is simpler in function, and it's set up to allow basic functions such as aileron/rudder mixing. This has no place on a fun-fly plane because, as stated earlier, we want the most axial roll we can achieve, and any amount of rudder will impart a wobble to the roll.

• **FLP.P—flap-valve adjusting knob.** This feature is really valuable because we really don't need much flap trim authority. If there's too much and the flap knob is accidentally knocked, your plane will fly as if it's possessed. Once I have arrived at a good location for neutral on my flaperon, I usually null out all but a few percent of throw to the flap knob.

• **FALS—fail-safe for PCM.** Fun-fly aircraft are flown so low to the ground (and rarely in a level attitude) that there's little hope of finding a safe position for a fail-safe. The only solid bet is for your throttle to go to idle so that it can warn you of interference and possibly minimize the damage you could create or incur.

• **TRN.—trainer.** This function is quite advanced on the X-347. JR deserves a lot of credit for what I feel is the best trainer system on the market to date. You select which channel(s) your student can manipulate. This allows the instructor to choose which controls will be active on the student's transmitter. The student can be introduced to the transmitter as well as to the idiosyncrasies of the aircraft, one channel at a time.

Let's inhibit this function if you are going to set up a plane for competition. I would hate to see that switch accidentally pressed in the heat of competition.

Next month, I will discuss the new Airtronics 660 radio. Everyone throws around the phrase "user friendly" these days, but this radio breaks new ground when it comes to ease of use. See you next month! ■



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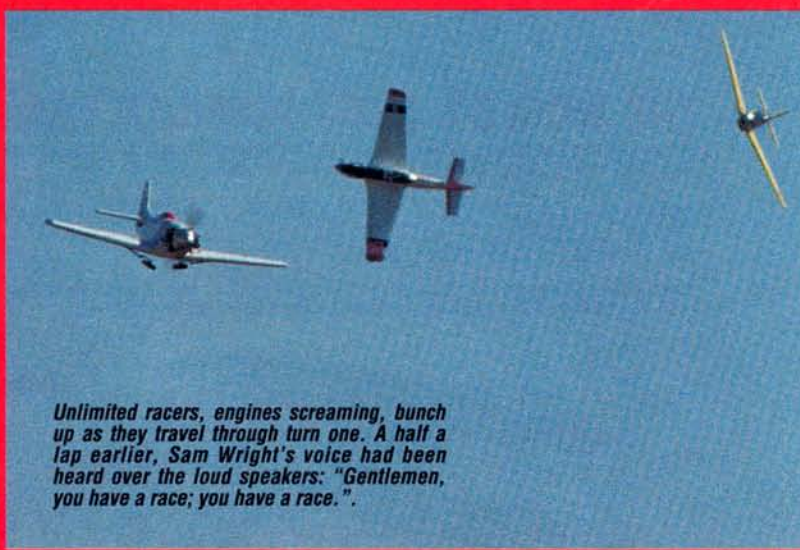
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# MADERA UNLIMITED



## MONSTERS OF



Unlimited racers, engines screaming, bunch up as they travel through turn one. A half a lap earlier, Sam Wright's voice had been heard over the loud speakers: "Gentlemen, you have a race; you have a race."

Above left: Shooting Star Show Team flew the pace planes. Left to right: Tony "Hoser" Arand, Kent "Burner" Nagy, Ron "Flash" Gilman, and crew chief David Eichstedt. Bob "The Radial" Walker's Robart/Zap Stinger, powered by a G-62 engine, led the giant racers into battle 62 times.

Left: Carla Kanak, VP of Precision Eagle Engines, wrangled with no. 69 on the flight line all week. The 30-pound P-51 was powered by a Precision Eagle in-line 4.2 twin; J & K products kit; Futaba radio.

by ROB WOOD

*Editor's note: in this issue, we provide an overview of the races and look at a few technical details. In the next issue, we will continue with the discussion of the technical achievements shown at Madera.*

**T**HE MADERA '92 races were held, as they were last year, at the municipal airport. Two days of tech inspections and qualifying were followed by three days of heat races leading to the moment of truth on Sunday. The heat races and, to a lesser extent, the qualifying flights, were filled with peril for the contending planes.

Left: with racing this tight, even the pylons were at risk. No. 20, flown by Ralph Braun, suffered minor damage.

Below & below right: John Krohn's big Seafury, no. 88, won Pilot's Choice. The big bird was destroyed in the blink of an eye (left) when aileron flutter ripped the outer wing panel off on a low pass. Built from Vaillancourt plans, the 54.5-pound plane featured fibreglassed balsa and lite-ply, carbon fiber/S glass wing skins, twin Futaba receivers and Likes Line retracts.



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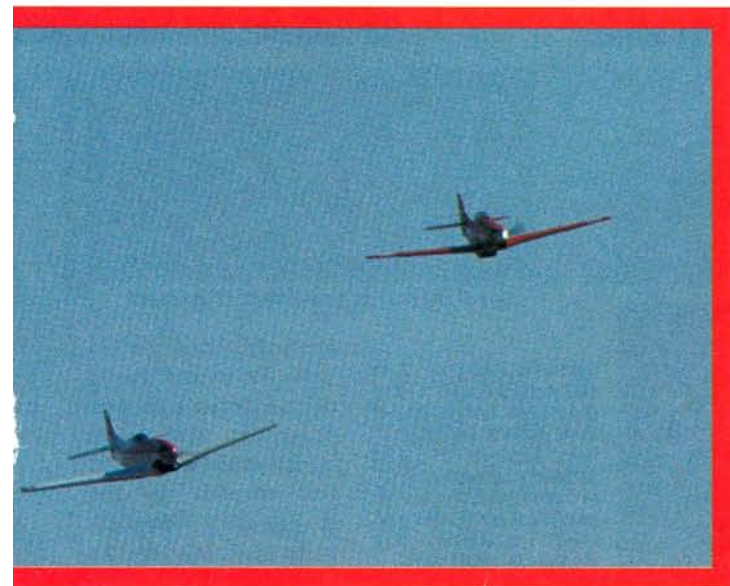
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# UNLIMITED RACES

## IN THE EDGE



*Above right: in the final seconds before the Bronze trophy race, the tension on the flight line is palpable. Former Model Airplane News editor Dan Santich (standing at center) awaits the go-ahead.*

*Right: trophy winners. Left to right, starting at the top: Don Rice, 1st, Gold (G); Brian Keil, 2nd, Silver (S); Duke Crow, 1st, S; Mike Johnson, and Kent McKenna (pilot) 1st, Bronze (B); Don Kanak, 3rd, S; Cliff Adams, 2nd, T-6; Mike Adams, 1st, T-6; Don Albright, 2nd, G; Ralph Braun, 3rd, G; Reno Clark, 2nd, B; Paul Curly, 3rd, B; Ken Bryant, 3rd, T-6.*



Aircraft with nasty tendencies displayed them before the crowd, and quite a few fell out of the sky. Duke Crow's G59 Fiat, one of three to be introduced to unlimited racing this year, tip-stalled at slow speed during qualifying and self-destructed. Kent McKenna's Fiat and Scott Manning's Fiat suffered a similar fate. "I guess we should build in a little washout, next time," said Dave Abbe, sponsor of the three entries.

In one of the more spectacular qualifying

*Circle at left: Gold trophy 1st-place winner Don Rice with no. 00. Not bad for a first try at Unlimited racing!*

*Left action photos: this was racing! Stinger Wallace's Stihl-powered Mustang, no. 47, was neck and neck with Don Rice's Aerrow 200S-powered Mustang, no. 00, for the first four laps of the Gold Trophy race, until the Stihl leaned out (see text). Who would have won?*



*Above: Richard Verano directs his crew to restart number-two engine as the three-minute start window begins to close. Magnificent 43-pound F7F Tigercat sported a pair of Precision Eagle 4.2 engines. Futaba radio, Robart gear, APC props.*



# MADERA UNLIMITED



Left: Pilots' eyes are glued to their AT-6s in a qualifying heat race. Fred Burgdorf of Landing Products (APC props) tirelessly aims the radar speed gun.

Below left: racers were assigned a colored light on the end pylons. As the aircraft passed the pylon, a caller turned the light on, and the pilot's observer yelled "Turn!" Radar speeds were up this year, overall lap times were slower—perhaps owing to this new system.



Last minute qualifying is shown. Many teams decided to have another run against the clock in the last hour of the last day prior to the start of the heat races.



Right: "Bare Belly," no. 10, was 1st-place Bronze winner. The 55-pound Bearcat earned its name when pilot Kent McKenna repeatedly bellied-in on landing. Made of glass/Kevlar composite, the plane carries an Aerrow 200S engine, 22x18 prop, JR PCM 10 radio and Gene Barton retracts.



One of several midair collisions at the races.



Left: after losing his G-59 Fiat during qualification, Duke Crow bought one of Dave Abbe's gold racers from Madera '91, and bolted in an Aerrow 200S in a race against time. He qualified for Silver and took 1st place. Sky Aviation kit; RCD radio.

**P**aul Ross and Jim Miller set out to make a strong, rigid airframe as a platform for their Aerrow 200S engine. Like many of the teams at this year's races, Paul and Jim did as much research as possible on composite materials and looked for a Reno racer on which to base their model. They chose Miss America—a clipped-wing Mustang.

Working from a fuselage owned by Billy Spears, the team made their own mold and built up a composite fuselage



No. 00, "Miss America," was built and flown by a team that included Don Rice, Paul Ross, Jim Miller, Don Westergren and Steve Shepersky.

**Model Airplane News:** What prompted you to build an Unlimited racer?

Ross: Competition. I just like the challenge.

**Model Airplane News:** How did the project develop?

Ross: From the idea to finding the best technology. It's a state-of-the-art airplane. Weed Whackers [local flying club] has a tremendous amount of talent. We get the best of the best, from aerospace to electronics to pilots.

**Model Airplane News:** Why did you choose Don Rice as your pilot?

## THE WINNING COMBINATION

out of fiberglass, carbon fiber and Kevlar, with a glass and Hexcel firewall. Using a set of Saxton foam-cores, they sheeted the flying surfaces with glass and obechi wood, with a custom carbon-fiber spar made out of a material called Triax (available from Diversified Materials in La Mesa, CA).

After sending their Aerrow 200S to Jim Pileggi's Porting Service in Santee, CA, they enlisted the aid of Don Westergren to design and build a prop for their application. Finally, they test-flew their racer in rough conditions in the California desert, refining and repairing until they had a winning combination. Here is Paul Ross on their efforts:

Ross: Because he can fly between trees. We have monthly Quickie 500 races, and you can tell a hotshot pilot from one who is cool and calm under pressure, can fly a tight course and take direction.

**Model Airplane News:** What advice would you give newcomers to the sport of giant-scale racing?

Ross: Do your homework! I can't make it any plainer. You said it yourself in your article last year. We followed your rules! Print it again! If it isn't built right, it isn't gonna fly. If your pilot doesn't know the airplane, he's not gonna win. [See "Showdown at Madera," February '92 issue; sidebar—"To Win in '92."]

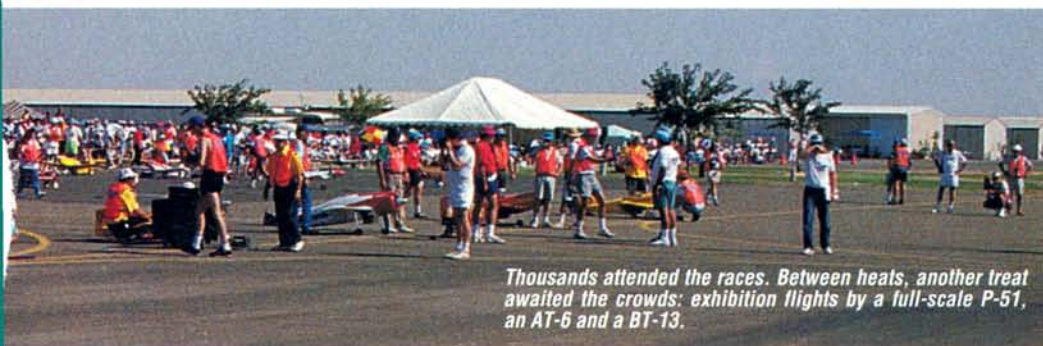
attempts, Dick Sizer's 8.4ci Precision Eagle engine decided to part company with his scratch-built Stiletto at full throttle in the straightaway. "Wooden props just can't take the rpm," said Sizer, who holds the unofficial giant-scale unlimited world speed record of 170, or maybe 180mph, captured at the Tucson races this year.

The heat races were intense, to say the least. In one of the most dramatic finishes of the week, Charles Langdon, flying a P-51 done up in WW II bare metal and invasion stripes (no. 41) drove around the final



Don Albright slides in no. 68 for a safe landing. Powered by a Precision Eagle 4.2, the 39-pound P-51 took second place in Gold.

# LIMITED RACES



Thousands attended the races. Between heats, another treat awaited the crowds: exhibition flights by a full-scale P-51, an AT-6 and a BT-13.



Sam Wright (center) did an incredible job as announcer throughout the races. Pacer (Zap glues) and RCD, were Charter Sponsors.



Three Byron Originals kits took the AT-6 trophies. Left to right: Cliff Adams, 2nd; Ken Bryant, 3rd; and Mike Adams, 1st.



Tommy "Robart" Walker's AT-6, no. 20, took Pilots' Choice. His plane combined a Saxton fuselage with Ziroli-designed parts cut by the Aeroplane Works.

## TROPHY STANDINGS

| POS. | PILOT       | RACE NO. |
|------|-------------|----------|
| 1    | Mike Adams  | 6        |
| 2    | Cliff Adams | 4        |
| 3    | Ken Bryant  | 17       |
| 4    | Bruce Brown | 15       |
| DNF  | J.R. Wilbur | 2        |

The AT-6 races at Madera had all as excited and on edge as the Unlimited races, and this may presage an exciting future for giant-scale racing. AT-6 racing is accessible to many modelers who don't have the time or budgets for the Unlimited class. The races are designed so that pilot skill is the deciding factor. Each entry had to be 1/5 scale with a wingspan of 101 inches. A Zenoah G-62 stock engine was required, with props and fuel provided by the race organization. Maximum permissible weight (wet) was 40 pounds; minimum weight, 25 pounds.

In the heat of the races, of course, anything can happen. Dave Shadell, noted Formula 1 racer who took 3rd place in the '91 Pylon Racing FAI World Championships, was taken out of the action during qualifying heats in a midair collision rounding a pylon. Spectators will have to wait for another T-6 race to see whether his



Scott Broughton holds a Dwight Warner fuse (from one of the DW AT-6 kits), which shows beautiful, lightweight structure.

skill set will lead to triumph. As one might expect, some planes appeared to be a little faster than others. Despite an incipient controversy among some very competitive personalities, nothing untoward was brought to light. Such contention probably comes with the turf in the early days of a new racing program, and policing methods (whether needed or not) evolve.

How much does it cost to race an AT-6? Somewhere around \$1,000. You will need a 5-channel radio, retracts, a G-62 engine (approximately \$300) and a set of plans, semi-kit or kit. More races are planned around the country—we will keep you posted.



Line-up for the trophy race.

AT-6 SOURCES: NICK ZIROLI PLANS, 170 Oval Dr., Central Islip, NY 11723; (516) 234-5038.

AEROPLANE WORKS (KIT FROM ZIROLI PLANS), 2134 Gilbride Rd., Martensville, NJ 08836; (908) 356-8557.

BYRON ORIGINALS (KIT, GLASS FUSELAGE), P.O. Box 279 Ida Grove, IA 51445; (712) 364-3165.

DW AIRCRAFT (GLASS FUSELAGE, SEMI-KIT), 409 Mid Pines Way, Modesto, CA 95354; (209) 522-7597.

SAXTON GLASS (GLASS FUSELAGE, SEMI-KIT), 3709 Longbridge Dr., Modesto, CA 95356; (209) 575-5067.

## AT-6's at Madera

by TOM ATWOOD



Gold-winning Mustang, no. 00, built by Paul Ross and Jim Miller, was clocked on radar in the Trophy race at 167mph. With Don Rice at the sticks, the 44-pound racer performed superbly. Scratch-built, the all-composite racer sported an Aerrow 200S twin with a custom-built prop by Don Westergren, an Ace radio, and Modified Century-Jet retracts.



In the final moments, it is up to the ground crewman (here Dave Marson) to decide whether the plane will fly. No. 84, flown by the Classical Racing Team, is a balsa-and-ply Stiletto that was grandfathered in to Madera '92 from the previous year's race.

# MADERA

turn, dove for the finish line just inches ahead of Mike Johnson's red-and-white Bearcat (no. 10) and kept on diving right into the ground! Number 10 was credited with the win, although the video tells a different tale. That race says more about the determination and all-out competitive nature of these races than words and photos can ever explain. For the entire race, the two constantly changed places. In the straightaway, the Bearcat pulled ahead of the Mustang. In the turns, the Mustang overtook and passed the Bearcat. Number 10 went on to win the bronze trophy, and (believe it or not) no. 41 is repaired and ready to race again. Maybe next year Lesley Burnett and Nancy Bridi (promoters of the Madera '92 races) will offer a trophy for *pluck*.

John Krohn, winner of last year's Technical Achievement Award for his outstanding Aerrow-powered Seafury, demonstrated the art of re-kitting when his new Seafury's prop lost a blade, the blade hit an aileron, and the aileron ripped off the outer wing panel. The airplane literally disintegrated at this writer's feet! Tom Atwood, leader-in-chief of *Model Airplane News*, ran up to me and asked, "Rob! Did you get that on film?" "No," I replied. "I was too busy running for my life!"

John plans to build another no.88 Seafury for next year. "I'm a builder," explained John. Amen! You may remember John's comeback triumph from last year. Plagued by ignition problems, he was not able to accumulate enough points in the heats to qualify for a shot at the trophy races. Standing by as alternate, John took Stinger

## STILETTO (NO. 00) vs. MUSTANG (NO. 47)

- **Engine weight 200S:** Aerrow—approximately 14 pounds with ignition, battery and pipes; Stihl—approximately 8 pounds with magneto and short pipe.
- **Fuel:** Aerrow—64 ounces of methanol; Stihl—35 ounces of unleaded gas.
- **Mass:** Aerrow has approximately twice the mass of the Stihl, with twice as much cylinder head protruding from the cowl.
- **Speed:** the aircraft flew at the same speed—literally wingtip to wingtip.

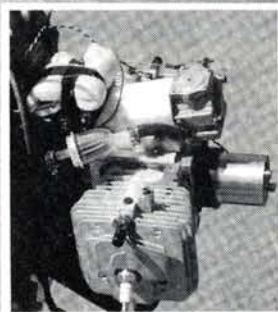


**Engine hop-up master James George shows off the Stihl engine that put Stinger Wallace's no. 47 in contention for the Gold.**

Leaving out piloting skills as a factor, we can attempt to "equalize" the aircraft from the data in order to explain why:

1. The Mustang's displacement is 4.5 cubic inches more than that of the Stihl, but it weighs 75 percent more and has twice as much drag.
2. The Mustang weighs 14 pounds more than the Stiletto, or approx. 30 percent more.
3. Methanol has a higher power-to-weight ratio than gasoline, but twice as much is consumed in a 10-minute flight.

**Conclusion:** the Aerrow 200S is more powerful than the Stihl 084, but it and the airframe weighs more and have greater drag, and this tends to neutralize its power superiority. This conclusion, of course, does not take into consideration the prop/engine match for each airplane, flying ability, or choice of unleaded, low-octane fuel for the Aerrow.



**Aerrow Inc.'s A200S opposed twin.**

| PILOT         | TYPE                 | MATERIALS       | ENGINE/CU.IN.          | FUEL           | WEIGHT       | PROP              |
|---------------|----------------------|-----------------|------------------------|----------------|--------------|-------------------|
| Wallace ..... | Stiletto (#00) ..... | Balsa/ply ..... | Stihl 084/7.4 .....    | Methanol ..... | 30 lbs. .... | Zinger (modified) |
| Rice .....    | Mustang (#47) .....  | Composite ..... | Aerrow 200S/11.9 ..... | Unleaded ..... | 44 lbs. .... | Custom            |

Wallace's place in the final gold race when Stinger's gear collapsed on takeoff, and he earned 2nd place and a trophy for his effort.

Spectators were treated to a similar version of John's story this year when Bryan Keil, flying a Husky-powered Stiletto (no. 84) for Classical Racing Team, stepped in as

the Unlimited Races, "That's what unlimited racing is all about, folks!"

The silver-trophy race was not without its share of misery, however. Somehow, after the race was over and the racers were in a holding pattern waiting to land, Paul Black's no. 131 and Ted Burns' no. 151—both P-51 Mustangs—collided and came down. As if the irony of a midair after a year of planning, building, test-flying and a week at Madera weren't enough, they were on the same team! I guess when your number's up it's up.

Now we come to the ultimate race in the Ultimate races. The battle for the gold always draws the most attention—not because the race is necessarily the most exciting, but because the gold trophy represents the pinnacle of any racer's dreams. To be the best. To outfly, outsmart, outbuild and outspeed everyone else. As Dick Sizer says, all the other races are just practice.



**John Elliot (left) tirelessly directed all flights for all races over several days. He was one of several who gave generously of their time to make these races possible.**

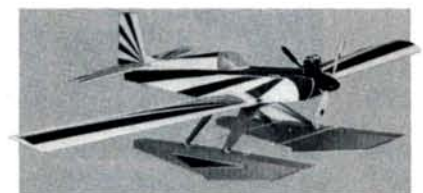
alternate in the silver trophy race when Joe Reichlin (no. 11) could not get his Mustang's 5.8 Sachs to start. Bryan flew a tight course and captured 2nd place and a trophy. Said Sam Wright, golden voice of

# MY FRIEND

My friend asked me to go **hunting**, so I took my **Classic 40 "Ultimate Bush Plane"**, and we had a real nice time.



My friend asked me to go **fishing** with him on his pontoon boat, so I took my **Colt 40 SLT** and my **Explorer Floats**, and we had a really good time.



My friend asked me to his family **farm** for the weekend, so I took my **USAC KnightHawk Multi-Mission plane**, and took the neatest pictures of his farm from real high up. They loved it.



My friend asked me to his **company picnic**, so I took my **Barnstormer "Bullet Proof" Biplane** (looks like a Stearman), and everybody had a wonderful time.



My friend asked me to play **golf** with him, I don't much like golf, so we didn't do that.

My friend asked me if he could **learn how to fly** too, so I took my **AirCore 40 Family Trainer** with my buddy box, and we had the very best time ever.



Now my friend has been asked to go hunting by one of his friends this weekend, I think he's going to take his **Classic 40 "Bush"** plane. My friend still plays some golf, but not as much as he used to. **It's nice to have a friend.**

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Model Aircraft Manufacturing

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# MADERA

In the race for the gold at Madera '92, however, two of the racers put on a show that had everybody's adrenaline pumping. Don Rice, flying Paul Ross and Jim Miller's Aerrow 200-powered Miss America, (no. 00) went head to head with Stinger Wallace and Don Albright's team, (no. 47). Powered by a

single-cylinder, Stihl 084 chainsaw engine, both airplanes were clocked on radar at 167mph! For four grueling laps, the two racers fought for position in the turns and tried to overtake each other in the straightaways, leaving the other aircraft far behind. In the fourth lap, Stinger's engine leaned out and died. Stinger landed on the main runway, and Don went on to win the Trophy. An exciting race by two outstanding pilots deserves a closer look (see sidebar).

The stars of this year's Unlimited Races, other than the pilots, crews and hard-working staff, have to be the Aerrow 200S engines. Klaus Nowak has produced a 2-cylinder, 196cc powerhouse that rose from a year of production problems to win every 1st-place trophy! Congratulations, Klaus.

The curtain has closed on another Madera extravaganza. Thanks to people like Lesley Burnett, Nancy Bridi, the Technical Advisory Board, Cal Orr—in the thankless job of CD—and a host of volunteers, the races were a success. The pace clipped right along, and over 4,000 spectators attended the event. There were some rough moments—technical inspection could have been a bit more thorough, and last-minute rules changes caused quite a lot of confusion.

The sport is evolving and growing rapidly—thanks in large part to companies like Zap, RCD, and Robart, which support the races financially, and people like Fred Burgdorf, who so generously provided his APC props (and burned himself to a crisp all day reading speeds with his radar gun), James George, Klaus Nowak, and Don and Carla Kanak (for all the R&D they are putting into producing better engines), Bob Obenberger whose True Turn spinners are truly works of art, and all of the people who



Ralph Braun (left) and team look confident as they prepare to race. Ralph's no. 20 took 3rd in Gold. Don Albright, Braun Racing Team, took 2nd place, Gold, with no. 68 (rear).

are working to make technology equal to the demands of high-speed, giant-scale racing.

The sport is growing at such an accelerated rate that another organization had to be created to keep pace with rules changes and proposed racing events around the country. Called the Giant-Scale Racing Association

(GSARA), the organization is open to anyone who's interested in Giant Scale Racing. For more information, contact: GSARA, 1744 Greenwood Ave., Torrance, CA 90503; (310) 212-3257; fax (310) 320-8354. ■

## TROPHY RACE STANDINGS—1992 R/C UNLIMITED AIR RACES

| Pos.        | Pilot           | Airplane | Race # |
|-------------|-----------------|----------|--------|
| <b>GOLD</b> |                 |          |        |
| 1           | Don Rice        | P-51     | 00     |
| 2           | Don Albright    | P-51     | 68     |
| 3           | Ralph Braun     | P-51     | 20     |
| 4           | Cliff Adams     | P-51     | 2      |
| DNF         | Stinger Wallace | P-51     | 47     |

## SILVER

|   |             |          |     |
|---|-------------|----------|-----|
| 1 | Duke Crow   | Stiletto | 70  |
| 2 | Brian Keil* | Stiletto | 84  |
| 3 | Don Kanak   | P-51     | 69  |
| 4 | Ted Burns   | P-51     | 151 |
| 5 | Paul Black  | P-51     | 131 |

## BRONZE

|   |               |         |    |
|---|---------------|---------|----|
| 1 | Kent McKenna  | Bearcat | 10 |
| 2 | Reno Clark    | P-51    | 05 |
| 3 | Paul Curly    | P-51    | 11 |
| 4 | Dan Santich   | P-51    | 09 |
| 5 | Jerry Kitchen | Corsair | 1  |

| Pilot        | Course Time | Est. Speed |
|--------------|-------------|------------|
| Don Rice     | 107.06      | 151.32mph  |
| Duke Crow    | 131.21      | 123.46mph  |
| Kent McKenna | 142.03      | 114.06mph  |

\* Flew as alternate to Joe Reichlin when no. 11 failed to start.

ALMOST  
READY-TO-  
COVER FUN



T H O R P E E N G I N E E R I N G

# FUNHAWK

by  
RON BLACK

**S**O I sez to myself, "What's all the excitement about these fun-fly competition airplanes, anyway?" That was before I saw the Thorpe\* Funhawk video at the Thorpe Engineering booth in Toledo! My first reaction was somewhere between "Gollee" and "Awww, you just can't do that with an airplane, can you?" I figured that now I'd seen it all: multiple loops with the top at a 6-foot altitude; near vertical, "parachute" landings; takeoff, three fast rolls and land again in 20 feet; aerobatic sequences that would tear the paint

off a pattern plane; touch-and-go's with full loop: three seconds, ground to ground; vertical rolls so fast that the wing tips blur.

It seems that fun-fly-competition airplane designs have several things in common: they're light, and they have a large wing area, thick airfoils, large control surfaces and large control throws. They fly slowly but maneuver quickly. They aren't hard to control, but when you get ready to explore the outer edges of the transmitter stick throws, things get spectacular. This is a new kind of R/C flying excitement for most of us.

## FUNHAWK

Advertised as an ARF, I found that the kit was framed up. It is, maybe, an ARC (Almost Ready to Cover). Although many of the fun-fly designs use a profile or tube fuselage, the Funhawk has a fully boxed fuse, much like a small Ugly Stik fuselage. I prefer the look of the full fuselage rather than a profile-style fuselage, but that's personal taste. Since this plane is just for plain good times, having a few more ounces on board doesn't matter.

The fuselage is built-up with balsa, some spruce and ply, and it's sheathed with what appears to be a 1/32-inch mahogany plywood. It's very robust and just as light as if it were all balsa!

I've never seen wing construction like this—a foam wing core, one piece, flat, 47x16x3-inch thick, D-tube planked leading edge with the aforementioned 1/32-inch mahogany veneer covering and a balsa leading and trailing edge. There is no spar, so rather than a D-tube wing, it's really a C tube. Half-inch mahogany capstrips were then glued onto the foam at the desired rib locations, and the foam-core bays between the capstrips were cut out. Then, someone went in and dug out the foam left up in the C-tube section. The result was a much lighter wing than you might expect with that 3-inch thickness.

The ailerons, rudder and horizontal stab are all of 1/4-inch and 3/8-inch-square balsa sticks. They're soft, light and diagonally braced. I had to rebuild portions of these (they were damaged in transit), but they were easily repaired since nearly everything had broken at glue joints. The instructions only have rough freehand sketches—but not plans—to tell you what you must do to complete the airframe. This airplane isn't aimed at a beginning flier, so I guess they figured formal drawings weren't necessary.

To complete the airframe and get it ready to cover, I had to complete several of the construction details and purchase and install the following: a fuel tank; an engine mount; pushrods; a wheel; the hardware, except for the steering arm (Sig\* EZ hinges were sup-

plied); and, of course, the covering.

A 4-ounce tank was recommended, but since I was using a relatively thirsty O.S.\* 28 FSR, I heated the front of a Du-Bro\* 6-ounce to reshape it, and it fit into the fuselage. The engine mount I used has a hole for a nose-gear wire, which allowed me to simplify the nose-gear mounting. I didn't use the separate mount block that was recommended (but not supplied). There was no indication about where to put the engine thrust line. (Well, I guess that looks 'bout right...there!)

The Funhawk uses a unicycle landing gear. There's a nose gear and two wire wing-tip outriggers. This is undoubtedly to save weight. A plastic tail skid for the center of the bottom-mounted horizontal stab was referred to in the instructions, but it was missing from my kit.

## AILERON SERVOS

Aileron servo mounts must be fabricated from hardwood sticks and epoxied into the bottom side of the wing. Although the plane can be flown very successfully with a 4-channel radio, separate aileron servos and a computer radio are really necessary if you're going to get decidedly crazy with the maneuvers that the Funhawk is capable of performing. The instructions tell you to place the servos 11.25 inches out from the wing's center line but, to better place the aileron horn, I moved the servo out 2 1/2 inches to the outboard side of the rib bay. I added a pine gusset block to make a solid base for the aileron control horn.

To put the servo mounts in place, simply cut through the top edge of the foam ribs just under the veneer capstrip. The servo rails (I used 1/4x5/16-inch pine) span the "rib" bay and are epoxied to the surrounding foam and the underside of the veneer capstrip. To anchor the covering, I added a third stick between the servo rails alongside the servo bay. To get the plane ready to cover, you must put holes through each of the foam ribs and also tunnel through 6 inches of solid foam in the center section, beneath the veneer covering, for the servo leads. I cut a 3/8-inch hole in the bottom of the center section and

## FLIGHT PERFORMANCE

*The first day out was a little windy. I recruited my flying buddy, Mel Wiggers, as my photographer.*

### • Takeoff and landing

Takeoff was straight with good rudder response as soon as the throttle came up, so the non-steerable unicycle nose gear worked fine! Ground run with the 28FSR was about 8 to 10 feet, with climb-out at about a 45-degree angle as far as you cared to go. To land, I kept the speed up to cover ground and then flare for touchdown. Plan on about a 20- to 25-foot roll.



### • High-speed performance

Although the Funhawk as an aerobatic fun-fly design isn't made for high-speed flight, it was stable with no particular bad habits, and it wasn't twitchy, either. The controls weren't touchy, despite the large areas and large deflections. Things worked normally, actually, and I quit gritting my teeth quite so hard. The wind caused the Funhawk to jump around a bit—yours would, too, with a 10-ounce-per-square-foot wing loading! It wasn't too long before I got up the courage to kick the dual rates up to high. Now the fun began! Those roll rates of two rolls per second are a B-Double *blast!* But you must "watch fast" too, to catch the thing right side up.

### • Low-speed performance

It was no sweat to get a walking speed pass down the runway. In wind, it was easy to get a near hover, or even back up a bit with a good gust. A little wing waggle because of the wind was noted, but control was maintained and no abnormal procedures were necessary to stay in slow flight, except for keeping the nose up while maintaining some throttle. I finally got it to stall (straight ahead), but you really had to try. Eventually, it just quits flying. You can deadstick from just about anywhere on the field, but that big, thick airfoil is draggy so, to get back to the runway, keep the nose down and speed up.

### • Aerobatics

Loops could be done at whatever diameter you wanted by simply hauling back on the elevator. The Funhawk never snapped out of a loop, even at full-up stick. At full-up stick, the loop seemed to consist of the tail skidding through and rotating about the wing center of lift. Minimum diameter was probably about 3 feet. Inverted flight: a shot of up to stabilize and then just a small up bias kept things on an even keel.

I cranked in a 50-percent flap with flaperon mix, which caused a nose-down reaction. If you look at the design, the horizontal stab is positioned below the main wing (unlike many fun-fly designs), and you can see how excessive flap throw can blank out the elevators and cause the nose to tuck at certain pitch attitudes. This was easy enough to cure. Re-program time: with only 30-percent flaperon and 30-percent up-elevator, the ship gave me the predictability in pitch I wanted. I also mixed in some exponential so that I had a low rate around stick center, but the last 15 percent of stick movement would go ahead and give me full throw as if I were on high rate. This is a great advantage for flying the Funhawk.

All fun-fly aircraft designs are light, and the Funhawk is no exception. However, the lightweight horizontal stab can only take the ground-dragging and rocking back and forth for a short time before it gives up and cracks. This is a competition airplane; long-term durability is secondary to lightness. This airplane is fun to fly, and it stretched my abilities on the sticks so that I could do the maneuvers that the airplane is capable of doing, and it taught me a few things, too.

## SPECIFICATIONS

**Type:** Competition fun-fly aircraft  
**Price:** \$139.95 (sug. retail price)  
**Wingspan:** 48 inches  
**Length:** 42 inches  
**Wing area:** 768 square inches  
**Weight:** 57 ounces ready to fly as configured  
**Wing loading:** 10.687 ounces per square foot  
**No. of channels req'd:** 4 (throttle, ailerons, rudder and elevator) computer mixing recommended  
**Engine used:** .28 to .40  
**Props used:** Master Airscrew 9.5x6 and APC 9x7  
**Airfoil:** 18.75 percent symmetrical  
**Washout:** none  
**Wing construction:** plywood planked foam with capstrips on foam ribs, C-tube leading edge, hollowed, no spar.  
**Kit construction:** balsa, hardwood and ply, almost ready to cover

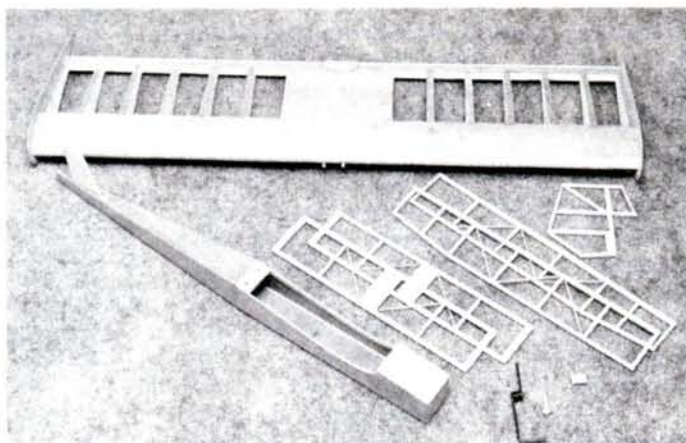
**Features:** almost ready to cover, built-up fuselage and foam wing. Wing is already sheeted and the material between the rib capstrips has been removed to further reduce weight.

### Hits

- Lightweight, pre-built, strong "box" fuselage has better appearance than other tail-boom-type fun-fly models.
- Excellent fun-fly aerobatic performance makes your typical sport airplane look tame.
- Gentle, slow flight manners when not performing stunts.
- Just about the most fun you can have with a Tx stick.

### Misses

- Minimal hardware.
- No control set-up, thrust-line instructions or printed plans, however, the ship is pre-framed.



*Out of the box, the Funhawk is almost ready to cover. It's light and doesn't use a lot of hardware.*

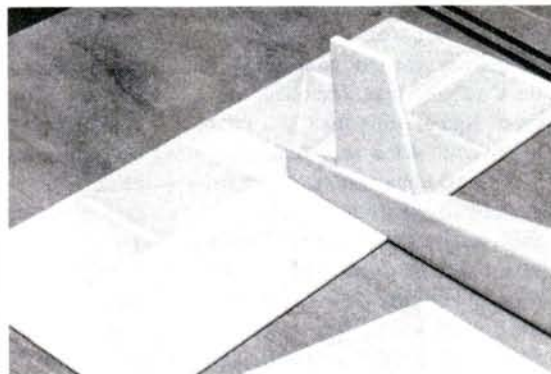
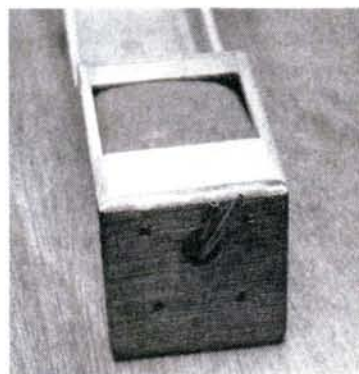
a 12-inch-long piece of brass tube as a hole cutter from the first rib bay through the foam to the center hole. Thread a piece of fine wire through the center section and out to the servo mount hole so that you can draw the servo lead and extension through this passageway when you mount the servo after covering.

## COVERING

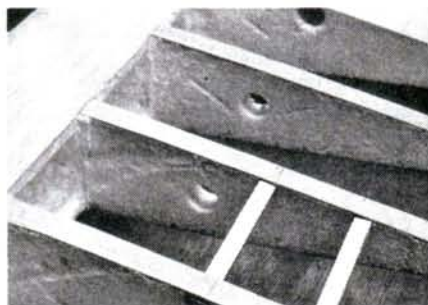
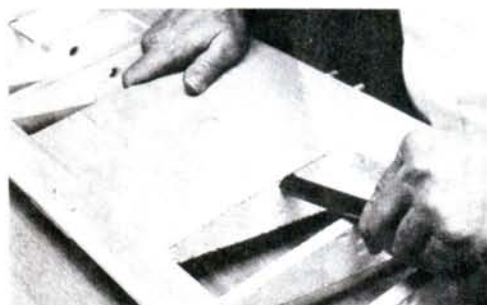
Being curious about the vaunted workability of Solartex\* heat-shrink fabric as a covering, I decided on a gaudy red-and-white scheme with big red stars from Coverite\* Presto and

found myself chasing new wrinkles every time I came back to work on the thing! A coat of clear dope was recommended as being lighter than paint, and in the interest of weight and getting on with the project, I decided to put up with the wood grain and the slight darkening around the glued joints that showed through the white areas. Nevertheless, Solartex is one of the easiest heat-shrink materials I've ever worked with, and overlapped edges seem to almost disappear. I kept the temperature of my iron at 275 degrees.

Coverite Graphics. Solartex is a very close imitation of silk and dope covering. The resulting finish is semi-gloss instead of the usual shiny surface of plastic coverings, and the white is almost transparent when it's put over sheeted surfaces. It must also be either painted or doped to stabilize the shrink. While it was bare, I



*Left: on the firewall, use the thrust-line location and engine mount of your choice. Right: Solartex covering is semi-transparent and resembles silk. Look at the size of those tail surfaces!*



*Left: a brass tube twisted and pushed through the center foam block to intersect with the wing center section servo-lead hole eliminated the need to saw through the planking and possibly weaken the center section. Right: servo rails in place and lead passage holes cut for servo leads. To anchor the covering at the edge of the servo bay, a third stick of rail material was inserted across these two rails.*

## SETUP

The only control-throw recommendation in the instructions was "use all the throw you can get," which left me worried about how fast I was going to have to be on the sticks, since the full-span ailerons comprise one third of the total wing area. My compromise was to set my Futaba\* 9VAP's dual rates at 30 and 100 percent. Aileron control throws still looked ridiculous even at 30 percent, but you have to start somewhere!

*(Continued on page 131)*

# GOLDEN AGE OF R/C



H A L D e B O L T

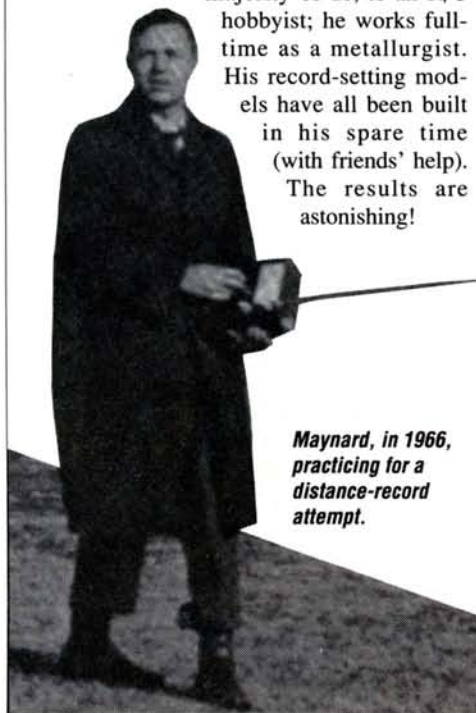
## ONE MAN'S CONTRIBUTIONS

WE'VE HAD another windfall! This time, it's courtesy of Dennis Perron of Quebec, Canada, and 66-year-old Maynard Hill, who's the subject of Dennis's letter. Is there an R/Cer who *hasn't* admired Maynard's many accomplishments? We've been searching for sufficient material for a discussion of this R/C pioneer's many outstanding endeavors, and the needed information finally came—out of northern Canada!

First, a few words about our helpful Canadian R/Cer. Thirty-year-old Dennis enjoys the sport with his father, who cut his R/C teeth in the early '60s on a Goldberg Falcon guided by a Min-X single channel. Today, Dennis and his father are still active in the hobby, and they have an extensive collection of OT R/C systems. Maynard donated his original two-tone pulse-width radio (TTPW) and Sampey 404 systems to the Perron collection.

### A BRILLIANT CAREER

Keep in mind that Maynard, like the majority of us, is an R/C hobbyist; he works full-time as a metallurgist. His record-setting models have all been built in his spare time (with friends' help). The results are astonishing!



*Maynard, in 1966, practicing for a distance-record attempt.*



*Maynard Hill with the model that earned the 1992 endurance record—more than 24 hours.*

Maynard's interest in aviation led him to Johns Hopkins University's Applied Physics Laboratory. There, he was a part of the Remotely Piloted Vehicles (RPV) program, and they earned a number of patents for altitude detection and stabilizing of the RPVs.

Recently, he headed the H-Cubed Corp., which performs research and development of mini RPVs and wildlife telemetry. They make the thermal sensor and auto pilots that automatically keep a model level. Neat stuff!

Maynard started R/C modeling in 1948 and, since then, he has been closely associated with the AMA. He served on numerous committees, and he was involved in judging; the first AMA "Judges Guide" in 1963 was his creation. He has been a U.S. delegate to the FAI,

served as an AMA vice president, and progressed to AMA president. He also laid the groundwork for the fine judging seen in the FAI today. We should thank him! Maynard's projects, such as contest directing, chairmanships, etc., are too numerous to list. Let's just say he paid his dues!

Maynard's letter to "Golden Age" describes his early R/C adventures. He became involved with the R/C hobby in Pittsburgh, where he was the president of the Pittsburgh Flying Circuits. As president, he organized the first Sellingsgrove R/C symposium; this is where I met him. Probably my most well-remembered encounter with him was at the 1959 California Nationals, where I nosed him out by one point and made the U.S.'s first World Championship team.

### MULTI-CONTROL IN THE EARLY DAYS

In the early '50s, like most of us, Maynard used various forms of single channel but wished for multi-controls. Then he saw Walt Good fly a TTPW-equipped Multi-Bug. Maynard had to have one! Walt had published an article telling how to build a



*A young Dr. Walter Good with his TTPW-equipped Multi-Bug, which inspired Maynard to learn about R/C electronics.*

TTPW system. Maynard says that although he was completely uninformed about electronics—he didn't know a capacitor from a resistor (but he could solder!)—he attempted to assemble it. That's like one of us trying to assemble a modern system from scratch!



**Maynard in his contest era at Tecumseh, MI. He placed second in pattern and first in pylon with his Pittsburgh Pointer in 1959.**

The two were friends, so when the first problem turned up, Maynard phoned Walt for help. Maynard says that it took him over a year to get his system operating. The phone lines between Pittsburgh, PA, and Bethesda, MD, nearly burned in the process. Maynard made five calls just to learn what a selenium diode was and what the arrow on it indicated. Such persistence! Maynard suggests that if Walt didn't have patience before, he sure gained it as their friendship developed.

R/Cers wanted multi-controls so badly that we went to amazing lengths. My experience parallels Maynard's. The phone lines between Buffalo, NY, and L.A. were also overheated as Zel Ritchie explained to me how to troubleshoot Space Control so that I wouldn't lose any precious flying time! Those were fantastic days for many of us!

Fortunately, reeds brought reliable multi-controls so the challenges that our radios presented became more mundane. Propo soon followed, and commercial systems quickly pushed all the homebrews aside. Maynard used a Sampey 404 analog proportional to establish his first record in '64. He reached 13,328 feet. For the most part, Maynard still uses commercial equipment for his record attempts, but his early electronic experience allows him to

make modifications for some special tasks.

So how did Maynard get started in this "record" business? In '60, he became disillusioned with contests, and he started looking for some other endeavor to whet his modeling appetite. His AMA and FAI activities took him to the second World Championships at Kenley, England, as chief judge. There, he learned that Russia's first entrant, Petro Valetchousky, held seven world records, even though his equipment was obviously only marginal. Watching him struggle with his poor equipment gave Maynard an idea: if Petro had set records with such unreliable models, what could be done with high-quality American systems? Maynard had found the game he was searching for.

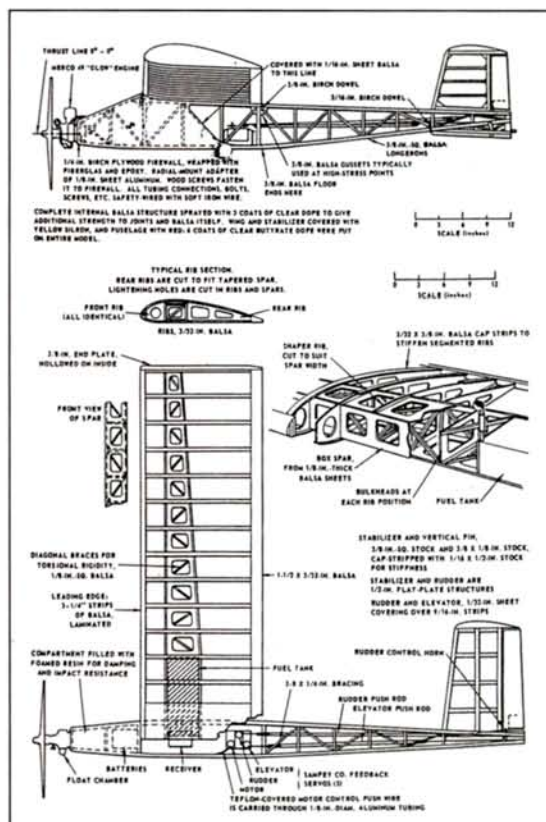
## BREAKING RECORDS

Back home, with the aid of the Washington D.C. R/C club he set out on the record trail. In a short time, he had easily eclipsed all the Russian records, and he was off and running. He says that since then, each attempt has become progressively more difficult. The latest—a 24-hour flight—was the most strenuous.

You have probably read the reports of this recent accomplishment, so I won't go into detail here, but some of his observations are enlightening. It took nearly a year of diligent work to establish the record. Along the way, he broke three airplanes, and he made six attempts before success came! He gives credit to his helpers, officials and crew who were prepared—seven times—to spend more than 24 hours with him at a desolate flying

field, regardless of the weather!

We R/Cers have built planes, and we have planned and prepared for several 10- to 15-minute flights at normal flying sessions. Have you ever stopped to contemplate what kind of effort it would take to extend one of those flights to an hour or two? What would be needed for the model to last through the rigors of continuous flight? How about the radio? What engine and fuel would ensure success? Could you make it that long? Beyond a normal sport flight, every little detail suddenly becomes very important to success. You can imagine the effort it takes to search for every weak spot and to correct it. It isn't easy!



**A typical Maynard record-setting design. He doesn't build pretty airplanes. Instead, he prefers to keep them simple to reduce potential problems on record attempts.**

Now you know what kind of man and modeler can establish 18 world records over nearly a 30-year span—and he hasn't finished yet!

With Dennis and Maynard's help, we'll discuss some of Maynard's record flights as this column continues. Stay tuned! ■



The happy design team of the Ligeti Stratos: (left to right) Joe Utasi—technician/pilot; Walt Bub—mold maker; Bill Griggs—designer and wing builder. Author holds his almost completed version. Will have an FAI .40 just for kicks. Three models have been built so far.

## THE YEAR OF SCALE



Keith Shaw's Horten IX V2B electric ducted fan.

1 K 9 R 9 C 2

# ELECTRIC FLY

by BILL GRIGGS



Master modeler Ralph Jackson of Endicott, NY, floored me with his 1/5-scale deHavilland DH2—a 1915-era fighter. Ralph really detailed the plane with a scale radial engine, functional flying wires and hundreds of rivets. Astro 60 motor; 28, 1800mAh cells; 15x8 APC\* prop. Span—67"; wing loading—20 oz./sq. ft.; weight—12 lbs. Top speed is a putter.

**E**VERY SEPTEMBER for the past 13 years, the Keystone Radio Control Club has hosted an electric meet. It has grown to be the largest, best attended meet of its kind, with people coming from all over the United States and the world.

The meet traditionally features fun flying with a few skills contests thrown in for spice. This year was no different, but the flight time went up drastically from last year. This was because of the hard work of Phil Landis, the frequency-control genius. He came up with a system that works; I don't know how, but it does. Last year, I said that frequency control was like being in a candy store with a pocket full of change but no clerk in sight. Now (if you will pardon the mixed metaphor) we have three barbers, no waiting. Good job!

I have attended the KRC meet every year since 1984, and each year is distinctly



How's this for detail?! Steve Strait's Swallow has everything—even a functional joystick and rudder pedals that move with the control surfaces!

Truly a scale masterpiece. Steve Strait's Sopwith Swallow shows just what can be achieved in electric scale. The model is built to a scale of 2" to 1" with slight area increase of the tail and wing. Flew well.

memorable because a different trend became evident as electrics evolved. The first trend was consistent flights. The next major milestone was ROG, followed by speed. Then aerobatics and big electrics became common. Lately, the trend has been toward the conversion of off-the-shelf kits. This year's KRC will probably be known as the year of the fine scale model.





**Bob Kress's (Kress Jets\*) soon-to-be-released P-38 Lightning.** The model features twin props driven by a single Astro .035 Cobalt from a centrally mounted twin belt drive. The batteries are housed in the rocket tubes; three cells in each rocket. Props are 9x7 Graupner\* geared 3.4:1. Span—48"; area—309 sq. ins.; weight—47 oz.; wing loading—23 oz./sq. ft. The wing is foam with 1/32" sheet, and the booms are 1" foam with 1/32" balsa sides covered by vacu-formed plastic shells (not shown).

Modelers have discovered that electric planes are a perfect platform for scale ships. Since there is little or no vibration to worry about, the structure of planes can be designed to maximize surface detail while minimizing weight. Only critical structural areas need to be built strongly. The rest of the plane can be built as lightly as possible.

Many of the scale planes at KRC could probably compete successfully in AMA scale events. Ralph Jackson's 1/5-scale model of a deHavilland DH2—a 1915-era fighter—was a perfect example of attention to detail. The plane featured a scale reproduction of a radial engine, functional flying wires, cable



**The final power system after much experimentation on the Sopwith Swallow is the geared Astro 40 motor turning a 9x12 prop. Fed by 18 cells, its performance is outstanding.**

controls and many rivets. The plane's top speed can only be described as a putter.

Steve Stratt's Sopwith Swallow also featured many scale details. It fea-

hurt the flight performance at all; the plane is rock stable and flies at scale speed.

This year, the electric ducted fan appeared in record numbers. There were no less than six, functioning, electric, ducted-fan models at the KRC meet. All five jets were capable of speeds in the 75mph to 100mph range, and all but one of the jets resembled their full-scale counterparts.

Earl Brightbill, Keith Shaw and Tony Fiori all brought more than one ducted-fan model. Earl brought the jet that started it all last year—a stand-off scale F-16 Falcon. This plane proved that electric ducted-fan models are feasible using off-the-shelf parts. This year he took a Sun Downer Phantom jet (an early, successful, Bob Violett, ducted-fan project). The Sun Downer is powered by an Astro



**Don Belfort of Clay, NY, scratch-built this 9' Citabria (foreground) from Bud Nosen (A&A Industries) plans using his own wood.** Weight: 13 lbs. with a geared Astro .60 on 32 cells; wing area: 1,550 sq. ins. with a 19.3-oz. wing loading. A spirited flier that can do minor aerobatics. Citabria written backwards is "airbatic."

## WINNERS

### 20 Loops—Fastest Time

1. Russell Pribanic .....54 secs.
2. David Grife .....55 secs.

### Best Scale

1. Steven Stratt .....Sopwith Swallow
2. Ralph Jackson.....deHavilland DH2

### Pilots' Choice

1. Keith Shaw .....Horten IX V2b
2. Paul McEntarfer .....Ford Trimotor

### 30 Rolls—Fastest Time

1. Chris True .....20 secs.
2. Dave Baron .....22 secs.

### All Up, Last Down

1. Jerry Smartt .....47 mins.
2. Rob Shipton .....46 mins.

### Best Old-Timer

1. Colin McKinley .....Valkirie
2. Al Yeagle .....Long Cabin

### Pilots' Choice

1. Richard De Angelis.....Flying Aces Stick
2. Ralph Jackson.....deHavilland DH2

### Best Biplane: Ralph Jackson—deHavilland DH2

tured a burnished-aluminum cowl that housed a scale radial engine. The swallow had every scale panel and thousands of rivets. It also had functioning cockpit controls that moved with the flight surfaces. The functional bungee-cord, split-axle landing gear really helps lend authenticity to the master quality ship. All this detail does not



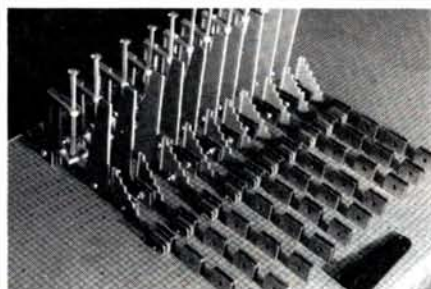
**Yes, this really is a scale model. Keith Sterner (Bath, PA) built this silver-and-yellow model of a Jeanie's Teeny, home-built in 1/4 scale.** Weight: 66 oz.; Astro 15 Cobalt geared motor on 12, 1000mAh E Series batteries. (Future Model Airplane News construction article.)

Flight\* FAI .15 motor that turns a three-blade Tornado prop. The plane remains unflown while Earl tries to adjust the amp draw to a reasonable level (presently 40 amps).

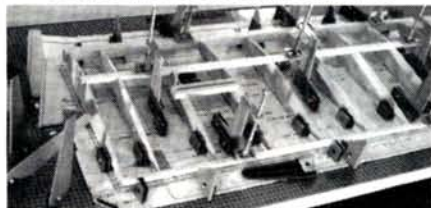
Keith Shaw took two ducted-fan models: a Horten IX V2B (Gotha Go 229, which won awards at Toledo) and a test-bed model, the Astro-Jet, which was used to develop the rotor system for the Horten. The Astro-Jet test model has an Astro .035 motor that turns a handmade impeller at more than 26,000rpm and loosely resembles the Heinkel He-162.

# THE MAGIC MAGNET BUILDER

The finest model building equipment manufactured



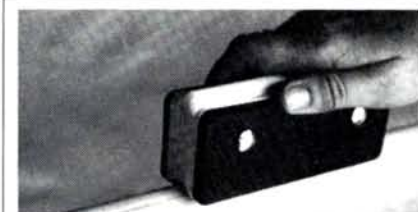
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## ELECTRIC FLY



Keith's Horten wing uses two 2<sup>5</sup>/<sub>8</sub>-inch-diameter rotors that Keith hand made. The rotor blades are molded of thermoplastic and mounted in a laminated-plywood hub. Keith built his duct using two layers of 1/64-inch plywood with carbon-fiber reinforcements. The rotors are turned at 32,000rpm by Astro .05 dragster motors on 10 cells each. Surprisingly, the most critical part of the Horten IX is the shape of the inlet lip. If the inlet is not properly shaped, the rotors will not operate efficiently, and performance will suffer.

Tony Fiori took a Midwest\* jetster with a Kress RK-40 duct with a Micromold impeller. Tony simply removed individual impeller blades until the plane flew the way he wanted. With only two blades on the hub, the fan turns at 22,000rpm. Tony used this knowledge to build a Paul's Flying Stuff\* F-86 that flew right off the drawing board. Unfortunately, there was a brick wall at the end of it. Tony is building another.

It is my pleasure to announce the successful flight of the Ligeti Stratos after three years of work. I got together with my good friends Walt Bub and Joe Utasi to build a model of the Ligeti Stratos—an Australian, joined-wing, shrouded-prop, ultralight. I did the design work, Walt made the molds, and Joe provided technical advice and built the first completed model.

For two years, we had the fastest race car with wings you ever saw. The plane simply would not leave the ground. Finally, through a series of minor adjustments, which included increasing the elevator size on the canard and lengthening the nose gear so the plane sat at a positive angle on the ground, the plane flew. The takeoff run is long, owing to the bicycle landing gear, but the Stratos is rock solid in the air and lands nose high, just like all jets.

Large-scale electrics are no longer a novelty. There were numerous large-scale electrics flying around throughout the weekend. Tony Fiori had a 1/5-scale P-51 Mustang converted from a Pica\* kit. The Mustang is the first plane I have seen fly with the new Astro Cobalt 90 motor. The plane weighs in at around 20.5 pounds and carries 40, 1400mAh cells. Tony originally flew this

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plane with a belt-driven Cobalt 60, but the power was marginal. The 90 direct-drive motor really brings this plane to life. When the Mustang turns away from you, it sounds just like a light plane.

Two Bud Nosen (A&A Industries\*) 1/4-scale Champion Citabrias flew many times. Tom Kerr had a gear-driven Astro Cobalt 40 in his blue-and-white model, while Don Belfort had an Astro Cobalt 60 geared motor in his red-and-white Champion. Both planes flew well, but my choice for power would be the 60. It just had more guts.

Speaking of guts...it takes guts for a manufacturer to go into new fields. When will the kit manufacturers wake up and make kits of scale planes designed specially for electric power? Perhaps that will be the next trend. See you next year in Quakertown.

\*Here are the addresses of the companies mentioned in this article:

**Astro Flight Inc.**, 13311 Beach Ave., Marina Del Rey, CA 90292.  
**Midwest**; Midwest Jetster available from Danielle's, 3141 Ambrose Ave., Nashville, TN 37207.  
**Paul's Flying Stuff**, 1281 Rincon Rd., Escondido, CA 92025.  
**Pica Enterprises Inc.**, 2657 N.E. 188 St., Miami, FL 33180.  
**A&A Industries**, City Rd. A22 P.O. Box 244, Sibley, IA 51249.  
**Graupner**; distributed by Hobby Lobby Intl., 5614 Franklin Pike Circle, Brentwood, TN 37027.  
**APC Propellers/Landing Products**, P.O. Box 938, Knights Landing, CA 95645.  
**Kress Jets Inc.**, 4308 Ulster Landing, Saugerties, NY 12477.

**T**HE 1992 SCHLUTER Cup is in the history books. This year's event will be remembered by staff and regular contestants as the first time in the past four years that the weather was beautiful for two days in a row during the competition. Added to the wonderful job that CD David Ramsey and the West Windsor Flying Club did running the event, this made for a very good time.

The event was held on September 12 and 13 at the Mercer County Park in West Windsor, NJ, and it was sponsored by Robbe/Schluter of Belle Meade, NJ. A change was made at the site this year—three flight lines were allowed. This allowed four rounds to be flown in Classes I and II and three rounds in Class III and FAI. All the competitors I spoke with were happy about flying more rounds, since it allowed each to throw away his lowest score.

#### CLASS ACTION

Once again, many of the top pilots from the ranks of FAI were on hand to compete. Wayne Mann took top honors



#### SPINNING WINNERS



# SCHLUTER CUP '92

by A.E. STANLEY



over 2nd-place finisher Dwight Shilling by 15 points. Third and 4th places went to Ted Schoonard and Mike Mas, respectively. One notable pilot in FAI was Ray St. Onge, who placed 7th last year and moved up to 5th this year. He has only been competing in FAI for two years, and he seems to be storming to the top.

This year's total of 74 pilots was slightly lower than last year's, although FAI picked up five more fliers for a total of 25. Class III had only nine pilots, Class II had 24, and Class I was quite busy with 24 pilots. Scale competition had seven fliers. Once again, the FAI flight line was shared with the guys from scale. I like this arrangement because it allows the spectators to see two very different aspects of model helicopter competition in one area.



*Top to bottom: ■ Ray St. Onge fires up his Schluter Futura for third-round competition. ■ FAI winners (left to right): Wayne Mann, Dwight Shilling, Ted Schoonard and Mike Mas. ■ G. Saragosa hovers his 47G on the flight line. This machine is built from a Vario kit. ■ This beautiful Vertol was built and flown by Mike Swift, who flew this machine well in a stiff crosswind.*

## ON THE FLIGHT LINE

Walking through the pits provided the uninitiated with a broad overview of what helicopter competition is all about. Most of the guys who showed up were out to have a good time and possibly earn some bragging rights at their own clubs. I noticed that the varieties of machines being flown at all levels is diminishing. By far, the best-represented machines were the X-Cell 60s, distantly followed by Kyosho, Schluter, Kalt and Hirobo.



■ Far left: Tim Lampe with his Concept 60 Interceptor. ■ Left: Wayne Mann hovers in the ready box. ■ Above: this Hirobo Lama, piloted by Jim Davey, walked away with flight points in scale and won overall. This machine is a great choice for scale because of its flight characteristics. ■ Right: Ted Schoonard's twin tail-rotor setup.

| FAI               | Helicopter   | Radio       | Motor       | Points |
|-------------------|--------------|-------------|-------------|--------|
| 1 Wayne Mann      | X-Cell Pro   | Futaba 9VHP | O.S. 61 SFN | 499    |
| 2 Dwight Shilling | Concept 60   | Futaba 9VHP | O.S. 61 SFH | 484    |
| 3 Ted Schoonard   | X-Cell Pro   | Futaba 9VHP | O.S. 61 SFN | 472    |
| 4 Mike Mas        | Hirobo Eagle | Futaba 9VHP | Enya 60     | 469    |

|        | Gyro       | Fuel      | Blades                      |
|--------|------------|-----------|-----------------------------|
| 1 W.M. | Futaba 153 | Magna 30% | DY-F1                       |
| 2 D.S. | Futaba 153 | Omega 30% | HY Prod. Progressive        |
| 3 T.S. | Futaba 153 | Magna 30% | Miniature Aircraft Pro wood |
| 4 M.M. | JMW        | Byron 35% | Homemade                    |

| CLASS III       | Helicopter | Radio       | Motor       | Points |
|-----------------|------------|-------------|-------------|--------|
| 1 Lance Murphy  | X-Cell 60  | Futaba 9VHP | O.S. 61 SFN | 369    |
| 2 Chuck Wildey  | X-Cell 60  | Futaba 9VHP | YS 61 LS    | 357    |
| 3 Ralph Dalusio | X-Cell 60  | Futaba 9VHP | O.S. 61 SFN | 343    |
| 4 Tim Lampe     | Concept 60 | Futaba 7UHP | O.S. 61 SFH | 341    |

| CLASS II         | Helicopter    | Radio       | Motor       | Points |
|------------------|---------------|-------------|-------------|--------|
| 1 James Griffith | Not Available |             |             | 581    |
| 2 Handoko Homman | X-Cell 60     | JR PCM 10   | O.S. 61 SFN | 529    |
| 3 Richard Bell   | Schluter      | Futaba 9VHP | Webra 61    | 528    |
| 4 Paul Soha      | Not Available |             |             | 527    |

| CLASS I          | Helicopter    | Radio       | Motor       | Points |
|------------------|---------------|-------------|-------------|--------|
| 1 Lance Frohman  | Concept 60    | Futaba 7UHP | O.S. 61 SFH | 389    |
| 2 Dan Zawerton   | Not Available |             |             | 387    |
| 3 Bill Comerford | X-Cell 60     | Futaba 7UHP | O.S. 61 SFN | 386    |
| 4 Handoko Homman | Hirobo Condor | JR 347      | O.S. 61 SFN | 384    |

| SCALE         | Helicopter                           | Points |
|---------------|--------------------------------------|--------|
| 1 James Davey | Hirobo Lama                          | 2,869  |
| 2 Mike Swift  | Hirobo Vertol                        | 2,742  |
| 3 G. Saragosa | Vario Bell 47G                       | 2,646  |
| 4 Tim Diperi  | Hirobo mechanics/<br>Jet Ranger fuse | 2,390  |

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A couple of the guys from Kyosho were sporting the new Interceptor fuse on their Concept 60s. Dwight Shilling and Tim Lampe had these machines looking good and flying hot. Despite its high price tag (approximately \$450), this fuse should be popular with the Concept 60 crowd. Another hot-looking fuse

is the Royal fuse for the Schluter Futura. St. Onge flew this machine very well in FAI.

A very interesting machine I saw at the competition was Ted Schoonard's X-Cell Pro. This is an all-new competition machine with composite frames and boom. The thing that really caught my eye was the use of two tail

rotors. This setup is very slick, and it's said to improve tracking in forward flight. It's also said to improve backward flight for those of you who are into hot-dog flying. I'm not sure when it will be available from Miniature Aircraft,\* but if you give them a call, they'll help you out.

Scale competition was pretty interesting this year. The two top contestants were both flying Hirobo kits. I say "kits" because these machines are sold as packages. You don't have to go through the usual process of buying a scale fuse and adapting it to your machine.

Top static points went to Mike Swift's beautiful Hirobo Vertol. Swift did a great job with this machine, which included over 5,000 rivets. Jim Davey took 1st overall in scale with his flawless flying. Davey flew the new Lama with impressive control.

With machines such as the Lama, Vertol and other new scale machines coming out, I expect scale will open up to more pilots over the next few years. There was one fatality in scale: Vince Riccobono crashed his Bell 222 UT on the final leg of his flight. (You may remember him as the winner of the Scout helicopter kit at last year's event.)

## THE BOOTY

This year's grand prize went to a very surprised David Schnitzer. He's a member of the West Windsor Club, and he was handing out prizes at the time. The look of surprise on his face was priceless. Second prize, a Futaba radio, went to Chris Kluth. There was also a pilot's raffle that gave almost every pilot a prize to take home.

The end of the competition came at around 3 p.m. on Sunday, and this allowed a little time for some demonstration flying. St. Onge put on a spectacular show with his Schluter

(Continued on page 130)

# NAME THAT PLANE

## CAN YOU IDENTIFY THIS AIRCRAFT?

If so, send your answer to *Model Airplane News*, **Name That Plane Contest** (state issue in which plane appeared), 251 Danbury Rd., Wilton, CT 06897.

British Columbia, Canada, for correctly identifying the November mystery plane. There were 40 correct entries.

The XA-41, a close-ground-support aircraft, was built by the Consolidated Vultee Aircraft Corp., and it first flew on February 11, 1944. Its top speed was 363mph, and it was powered by a 28-



cylinder, 3,000hp Pratt & Whitney Wasp Major XR-4360 engine. It was armed with four 37mm cannons and four .50-

caliber machine guns. It could carry a 6,400-pound bomb load, and its combat range was 800 miles. The 24,188-pound aircraft had a service ceiling of 29,300 feet. Only two XA-41s were built.

Congratulations to Alan Passingham of Penticton,



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# Wing Design, Part 2

## Wing configuration and drag

by ANDY LENNON

*The discussion of wing planforms started in Part 1 continues.*

### DELTA WINGS

The triangular shape of a Delta wing is so called because of its resemblance to the capital letter delta ( $\Delta$ ) in the Greek alphabet. These have very low aspect ratios. As Figure 3 indicates, low AR wings stall at high angles of attack—but with high induced drag as in Figure 4. Vortex flow is high, since a Delta wing is virtually all “wingtip.”

Deltas don't need flaps for landing owing to their high angle of attack capability, but should be landed with some power-on to overcome their high induced drag. Power-off, they have the glide characteristics of a brick!

A tailless Delta-wing model, with the whole trailing edge composed of elevons, is highly maneuverable, will not spin, but requires symmetrical or reflexed airfoil sections for longitudinal stability.

Structurally, Deltas are very strong. The deep, wide center chord promotes strength, and the low AR reduces the bending moments at the wing's center.

### COMBINED RECTANGULAR AND TAPERED WINGS

This planform is rectangular for roughly 50 percent of the semispan (inboard) and tapered for the remaining 50 percent to the wingtip. Piper Warriors and Cessna 172s typify this planform. It comes close to the elliptical in shape and efficiency, yet is more easily produced than a tapered or elliptical wing. The comments in Part 1 regarding the hazards of low  $R_N$ s of narrow wingtips apply. The rectangular inner portion is wider in chord, which provides a strong wing root, and bending moments are lower than for a rectangular wing.

### ASPECT RATIO

This important ratio is that of wingspan to mean chord. Its formula is

$$\frac{\text{Span}^2}{\text{Area}} = \text{Aspect ratio}$$

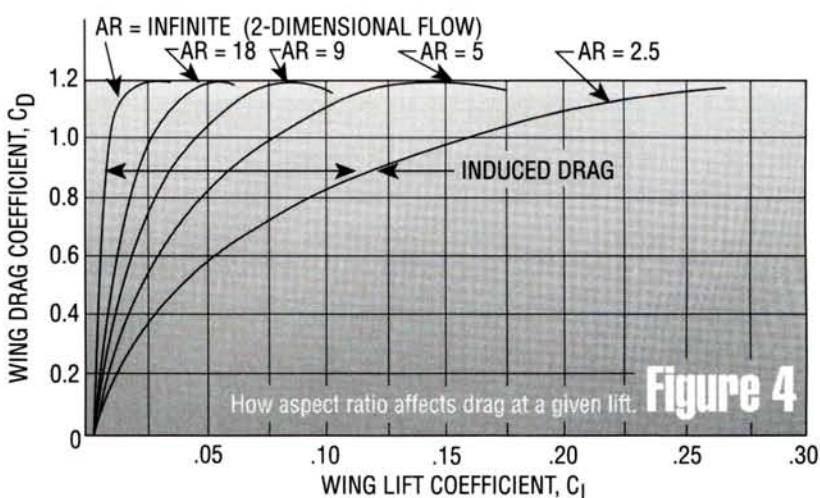
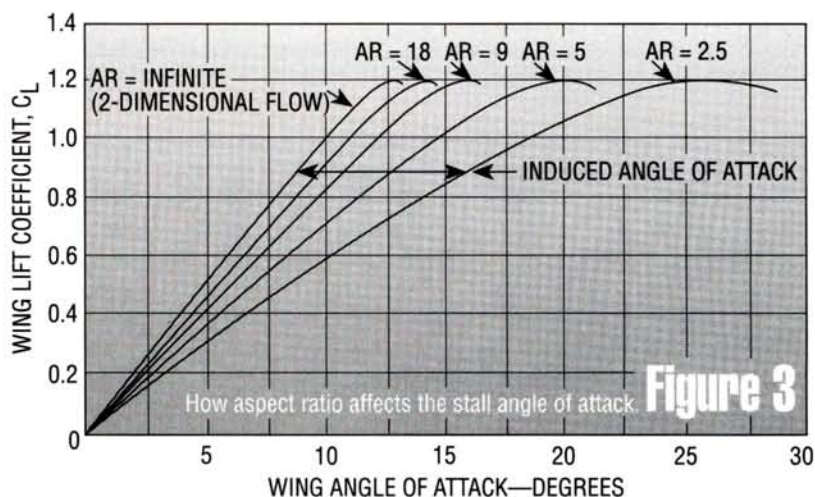
The Swift's wingspan is 61.625 inches and its area is 600 square inches. Its AR is

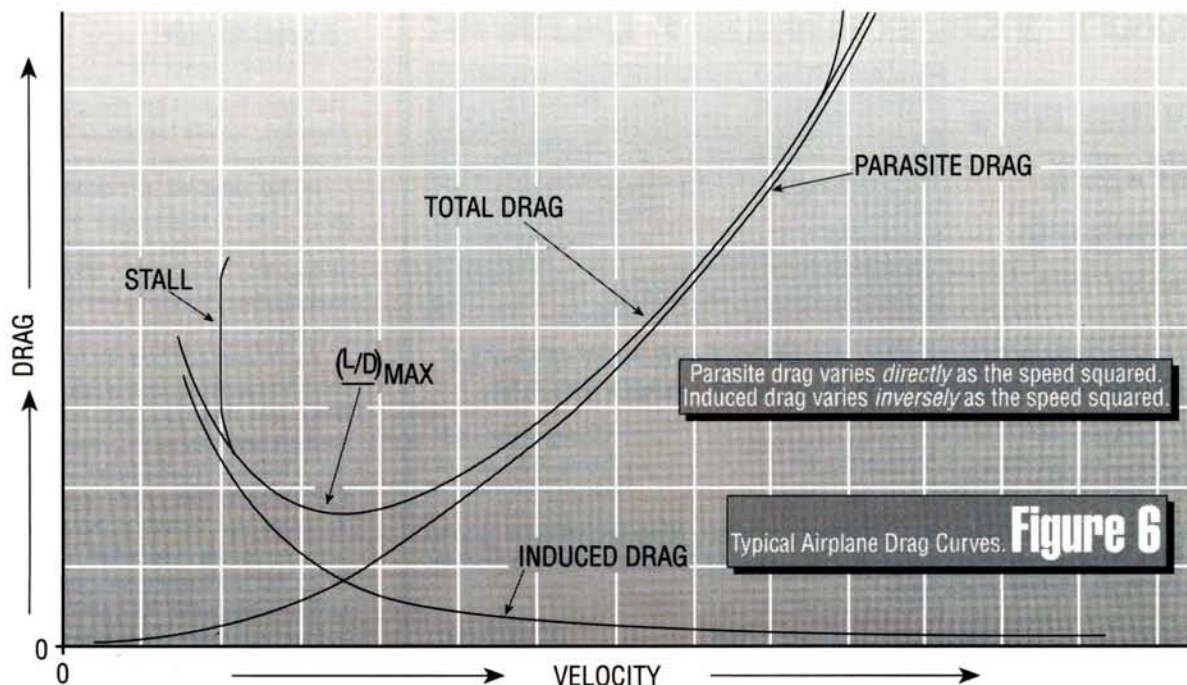
$$\frac{61.625^2}{600} = 6.3$$

The aspect ratio of a wing has a major impact on its “induced drag”—defined as that drag

owing to the development of lift—and is separate from the drag owing to the wing airfoil's form and friction, called “profile drag.” See Figures 4 and 5.

As Figure 5 indicates, increasing the angle of attack causes the lift to tilt rearward, resulting in a horizontal vector that produces induced drag.





The classical formula for the induced drag coefficient is

$$\frac{\text{Lift Coefficient}^2}{\pi \times \text{Aspect Ratio}} \text{ or } \frac{0.318 \times C_L^2}{AR} = C_{Di}$$

Obviously, the higher the aspect ratio, the lower will be the induced drag coefficient—and the lower the induced drag. This is why soaring gliders have such long, narrow high-AR wings.

An airplane's total drag is composed of two types: parasite drag (including profile drag) which doesn't contribute to lift; and induced drag, which results from the wing's production of lift. Figure 6 illustrates this relationship.

Induced drag has a very significant difference from both lift and parasite drag. The latter two are proportional to the square of the speed; induced drag, however, is inversely proportional to the square of the speed. It's lowest at high speed and highest at low speed. Lift and parasite drag are low at low speed and high at high speed.

At 100mph, the total of profile and induced drags for the Swift is 22.4 ounces, of which the induced drag is 0.215 ounces—or less than 1 percent. At 30mph, total wing drag is 4.3 ounces, of which 2.3 ounces, or 54 percent, is induced drag—useful in slowing this model for landing.

It's this relationship that explains the power-off, brick-like glide of a Delta wing.

The low AR and high lift coefficients result in very high induced drag for low-speed Delta flight.

Figure 6 depicts typical airplane drag curves. Where the induced drag equals the parasite drag is the speed of the maximum lift-to-drag ratio and of maximum range.

Range, for model airplanes, is not a factor of any consequence, except in rare instances, since most powered R/C flights sel-

dom exceed half-an-hour in duration.

## ASPECT RATIO PROS

For a given wing area, increasing the wing's aspect ratio will reduce the induced drag (Figure 4). The narrower chord tips result in smaller wingtip vortices; the lift per degree of angle of attack increases so that the model flies at a lower angle of attack (Figure 3). These all favor high ARs.

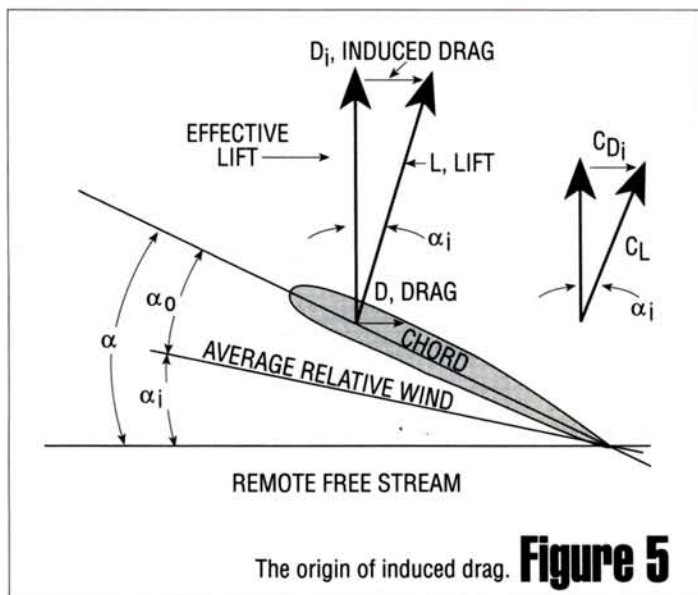
## ASPECT RATIO CONS

Lower chords on smaller models result in lower  $R_{Ns}$ —particularly at low speeds. Scale effect causes an increase in wing profile drag, a reduction in maximum lift and lower stalling angles.

The centers of lift of each wing half are further from the fuselage for high-AR wings, resulting in substantial increases in root bending loads. In addition, long, narrow wings must be stiff in torsion to prevent twisting under loads from two sources—pitching moment changes as the model maneuvers and the opposed action of ailerons. Wings weak in torsion have been known to experience “aileron reversal.” This occurs when heavy down-going aileron action twists the wing leading edge down. The up-going twists the leading edge up. The model banks in a direction opposite to that intended by its bewildered pilot.

High aspect ratios result in weight increases, particularly for models designed for high speed where high centrifugal loads are encountered. Increased weight results in higher wing loadings and higher parasite drag.

Obviously, there must be some compromises. This discussion will continue in Part 3.



The origin of induced drag. **Figure 5**

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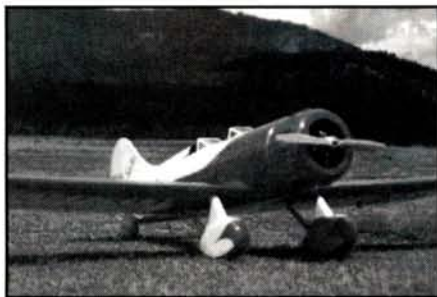
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## STARSHIP

(Continued from page 58)

The trees reached up and grabbed our plane. Stunned, we all looked at one another and began to walk. Now it was too quiet.

In this situation, it's really up to the "tree gods"; they're either angry or they aren't. I've put two planes into those oaks, and one is still flying; the other...well, the tail feathers are hanging from a joist in my workshop. Luck of the draw.

As we emerged from the thicket, we saw that there was good news and bad news. The good news was that the plane was caught in the smallest branches as if it were held gently in a net. It looked virtually intact. The bad news was that it was 80 feet off the ground in the top of the tallest tree. Getting it down without damaging it was going to be tough.

As we were discussing the best course of action, a spectator, who had been at the field before, volunteered the help of a friend, who was supposed to be an absolute monkey when it came to climbing trees. At the same time, some telephone workers, who had seen the action, showed up and debated whether their truck's bucket could reach the plane. It wouldn't. The spectator who thought his friend could help returned with us to the pits and called him on a car phone. The friend never showed. Darkness fell.

That night I spoke with a professional tree trimmer who said he would try to retrieve the plane the next day. He didn't know whether he would arrive in the morning or in the afternoon; probably the latter.

### TIMING IS EVERYTHING

Friday, May 29, the day of the murder. At 11:30 a.m., I drove past the field. The wind was blowing, but our bird was still there. I returned to my office hoping there would be a message from the tree man telling me what time he was coming. I didn't know it, but our luck had run out.

At 1:30 p.m., Dan drove by the field to check on the plane. I was still in my office. About 2 p.m., I had noticed that the wind was picking up. An hour later, I left the office and

(Continued on page 114)



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## Designed To Change The Way People Fly!

## STARSHIP

(Continued from page 110)

headed for the field. The wind was gusting at 20 to 25mph. I was concerned, and I couldn't shake a funny feeling I had all day. I arrived at the field. The day before when the breeze blew, I could see a white glint every now and then in the trees. Now there was nothing. I walked faster. As I entered the clearing through the thicket, my heart sank. I saw something white; it was large. Oh, no! Don't tell me nature had thrown the bird from its nest.

Damn! It was an 18-inch hunk of the fuse; this wasn't good! There were pieces strewn about, but something was wrong here—very wrong! There weren't nearly enough pieces, and they were the wrong ones.

I saw the tipsails but no part of the wing. I saw 18 inches of the fuse, but only from the forward wing, and control hatch back. I saw the scoops from the engine nacelles and a lot of small balsa pieces, but that was it—nothing else! The plane wasn't in the tree! I spotted a pair of sunglasses, cigarettes and a lighter. What I said is definitely unprintable! Dan and I had been robbed, and they murdered the bird in the process. It had been ripped apart. I just stood there and let everything I saw confirm my diagnosis. There was no doubt. None! My heart was broken.

Dan lives five minutes from the field; I was there in two. "Dan, you aren't going to believe this; sit down."

We returned to the tree. Dan also came to the inescapable conclusion but, like a true detective, he began to follow a trail of pieces through the woods for at least an eighth of a mile. We ended up behind a small manufacturing plant and followed the crushed grass to a parking lot. The plant foreman remembered a couple of unfamiliar cars at around 2 p.m. End of trail.

Saturday, May 30, 12 to 3:30 p.m. A dreary, wet, cold, late-spring day. It had rained all night, and that matched my mood. We went from the police station to the crime scene; trust me when I say "crime." The amount of money involved in the theft warranted felony charges. I thought the police would take the information and say that they'd get back to us if anything

(Continued on page 126)

## 1/32 SCALE PLASTIC KIT



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# CLUB OF THE MONTH



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Everyone has his own reasons for joining a club: to be part of a recognized, respected group; to gain access to a well-maintained flying field; to learn from enthusiastic instructors; or to help other members improve their skills. If all these reasons for club membership count—and we think they do—then the FLYRC club of Danbury, CT, is a model R/C organization. The club's members teach newcomers to fly; and the program committee ensures that meetings are interesting—aeromodeling guru Fay Stille, master scale builder Chauncy Dance and past *Model Airplane News* editor Walt Schroder have all addressed the members. The club tests engines' dB levels and enforces noise regulations because they value their good relations with those who live near their flying field.

They're also involved with the local Cub Scouts and Big Brothers and Sisters. To encourage a new generation of modelers, the club periodically involves youngsters in fun-fly and demonstration flights. Once "hooked," they are encouraged to join the club and learn to fly under the close supervision of the club's flight instructors.

The club leases its flying field from a farmer. What was once a rough cow field is now a beautiful, smooth, well-manicured flying site with picnic tables and benches, a frequency-control board and a shed for the field mower. The dynamic members of FLYRC have their eyes on the future. Two free subscriptions are on the way!

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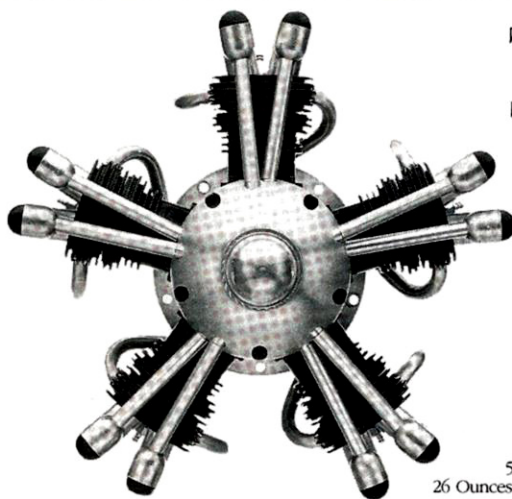


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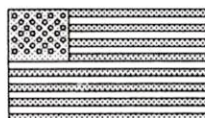
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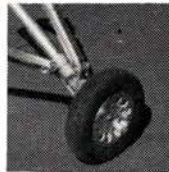
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## STARSHIP

(Continued from page 114)

broke. No way. They treated this really seriously. God bless 'em.

Will they ever find the "vermin" who did this? Probably not. Dan and I had invested a lot of money and time in the Starship, and we had a good time solving the problems that confronted us almost daily. We produced a magnificent plane that flew. Nobody can rob us of that.

What really bothers me the most is that "outsiders" did this thing. They had to; no real R/Cer would, in my mind, ever consider trashing a unique bird like this, just for the parts. Steal it, maybe; murder it—never!

Here's the warning, if you hadn't figured it out already: beware of outsiders and what you tell them and where you let them go at your field! Until they make the commitment to join, build and fly, keep them at arms' length, and tell them nothing about what your planes, engines and radios are worth! Will we try again?—probably not for a long time.

A while later, I saw Dan at the field. He had a couple of his planes there. Dan likes to fly. He asked me what I'd brought. Nothing. I had just

stopped by on my way home from work. I hadn't touched my R/C stuff since the murder.

Late June 1992. Time has passed and, with it, the shock and depression. The perpetrators have not been caught, but the word is out to all the clubs and hobby stores in the area. We've even got our swap-shop junkies on the lookout.

Dan and I have both developed a sense of determination about this bird and the whole incident. We have something here that's really interesting and a couple of idiots aren't going to take it away from us. So, we're going to find out how the Starship behaves with an articulating forward wing, flaps and retracts.

The construction of our "Phoenix" started today.

## VIDEO VIEWS

(Continued from page 49)

With models this large, pilot figures are necessary; it seemed odd to see an otherwise stupendous Fokker Spider—its many wires resembling a web—fly with two empty cockpits. Other than that faux pas, the models in the air are as realistic as models can get. If you

weren't told otherwise, many of the flying sequences could be passed off as having been performed at a full-size air show. This effect is enhanced when two or more models of contemporaneous prototypes are flown together: four Zeros strafe and bomb the field with appropriate pyrotechnics; two Ultimates fly in formation; two classic deHavillands share the air.

*Magnifique!*

## ALCYONE

(Continued from page 55)

of the left." One might assume that any turning tendency that results is minimal or insignificant, but I did not investigate. My recommendation is to use two individual servos with a "Y" cord or on separate channels. This also provides tighter control and protection against flutter.

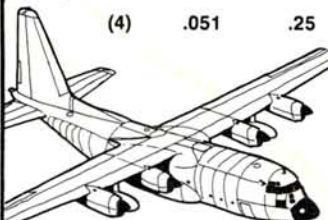
The spars are made of 1/2-inch spruce stock and 1/2-inch balsa webs. Carbon-fiber tape is mentioned as an option in the instruc-

(Continued on page 130)

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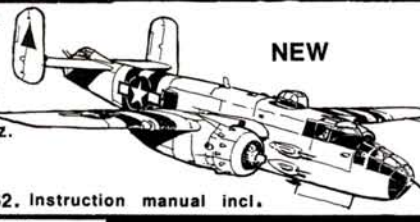
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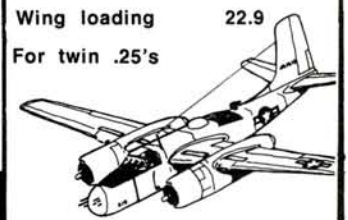
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## ALCYONE

(Continued from page 126)

tion book and, of course, we used it to facilitate monster-zoom launches! Another nice touch is the spar jig. It comes drilled and is a cinch to use to ensure accurate wing alignment, because it automatically aligns the dihedral and sweep angle before the spars are glued into the cores.

### WING SHEETING

Many modelers have a tough time hiding the seams between sheets used on the wing-surface sheeting. I used "sandable" Titebond to join them and came close (old-fashioned Ambroid works well). Since I had an opportunity to vacu-bag the wing, I used epoxy to adhere the skins to the cores. John used the weight-on-core method as shown in the instruction booklet.

Both test models were covered with MonoKote\*. John's model came in at 60 ounces, and mine weighed 69. After flying a while, John added 7 ounces of ballast and feels it flies better, so he plans to add a little more. The heavier model also has long wiring harnesses made of heavy gauge wire (four 36-inch-long strands) and a more forward center of gravity because the cavity in the nose block is full of lead shot (the lighter one has no nose weight added). When comparing them at the flying field, we estimated the tow-hook position on the lighter model to be about 1/2 inch behind that of the heavier model.

For your information, I'm including initial flight-test control-movement settings that represent a safe start. As time passes and we become more familiar with the plane, we will make small adjustments to these settings until the airplanes are trimmed exactly the way that we want them. For us, this fine tuning can take as long as a year to accomplish! We have enjoyed flying the Alcyone and look forward to the coming flying season!

\*Here are the addresses of the companies mentioned in this article:

**Northeast Sailplanes**, 16 Kirby Ln., Williston, VT 05495.  
**MonoKote**; distributed by **Great Planes Model Distributors**, P.O. Box 9021, Champaign, IL 61826.  
**JR Propo Remote Control**; distributed by **Horizon Hobby Distributors**, P.O. Box 3726, Champaign, IL 61826.  
**Airtronics Inc.**, 11 Autry, Irvine, CA 92718.

## SCHLUTER

(Continued from page 100)

Scout. He's truly an incredible hot-dog flier. At the end of his routine, he came down and gave "Charlie" a lift. Charlie is Robbe's R/C skydiver. The crowd was treated to several jumps by Charlie. Tim Lampe fired up a Concept 10 and put it through its paces. I was very impressed with the power that this little machine has.

By far the most impressive show was put

(Continued on page 136)

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## FUNHAWK

(Continued from page 84)

The total weight, ready to fly, was 57 ounces. Since the horizontal stab drags on the ground, two more Goldberg\* nylon wing-tip skids were mounted on the outboard edges of the fixed horizontal stabilizer. I ground these outer skids down some to allow the tail to tip without putting pressure on the horizontal/fuselage glue joint when the Funhawk tips. It rocks side to side some, even with the wing-tip skids.

In summary, I wished for better information for the initial setup (flap percentages, elevator-mix percentages, aileron reflex, and so on) and what a "normal" control throw might be as a starting point. But the Funhawk is a fine flier for sport flying or fun-fly competition. In spite of its capability to do nutso flying maneuvers, it really is a gentle, easy flier when flying "normally." And where the men get separated from the boys is behind the sticks, 'cause this airplane can probably fly better than you can.

\*Here are the addresses of the companies mentioned in this article:

**Thorpe Engineering Corp.**, 1715 E. Fairfield, Mesa, AZ 85203.

**Sig Manufacturing Co.**, 401 S. Front St., Montezuma, IA 50171.

**O.S.**; distributed by Great Planes Model Distributors Co., P.O. Box 9021, Champaign, IL 61826-9021.

**Du-Bro Products**, 480 Bonner Rd., Wauconda, IL 60084.

**Solartex**; distributed by Hobby Shack/Global Hobby, 18480 Bandilier Cir., Fountain Valley, CA 92728.

**Coverite**, 420 Babylon Rd., Horsham, PA 19044.

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## WET-WEATHER SOARING

THIS MONTH'S topics are all related to flight performance. Flying on cloudy, overcast days presents some interesting soaring conditions, and I'll discuss some techniques for maximizing flight time. Of course, rain usually comes with the clouds, so you have to understand how the rain will change your sailplane. Finally, I'll show you how to make some cheap seals for control-surface gaps to reduce drag and improve flight performance.

### FLYING WITH A LOW CEILING

One great part about flying sailplanes is you can enjoy flying on many days when power fliers stay home or pack up. Strong winds? Add ballast. Cloudy, gloomy weather? That's good for soaring, too. Good flight times are possible even on some of the worst-looking days. I'll talk about how to identify the best air for flying, how to deal with extremes like very low ceilings and, finally, how mist and rain affect flight performance and how you can deal with these changes.

When the ceiling is very low, the clouds provide a good indication of lift and where to fly. The key indicators are darker clouds and low-level scuds (loose, vaporous clouds). The darker areas are usually the lower clouds where you can take advantage of the air rising upward. You have to be careful, since you may see your sailplane disappear into these clouds. Don't panic; just keep flying the model. One way to work around this visibility limitation is to circle at the edge of these clouds with the model disappearing and reappearing on one side of the circle. Low-level scuds are good indicators of possible lift and are most useful on days when the primary cloud base is higher.

If you lose sight of the model, don't panic. Now is the time to try some flaps or spoilers. They will reduce lift and bring down the model to where you can see it again. Always visualize where the model



is flying, and this will make it easier to track when it reappears. Don't over-control the model, or you may end up with some violent maneuvers! Spending more time in the clouds means you're higher than your competitors and will have a longer flight because of it.

Launching into a low ceiling is another problem. The model might disappear near the top of the launch. If you are conservative, release below the clouds, and try to launch into the brighter cloud areas, i.e., where there is better visibility. A more aggressive approach is to maintain constant altitude and gain speed on the winch without pulling up to zoom on release. Use this speed to cruise off the launch.

Look for a launch corridor of bright sky in which you know you will not reach the clouds. Launch toward that area to get the maximum altitude possible while maintaining visibility. Watch for bands of light and dark clouds. Maybe a little "sand-bagging" is in order to wait for the best launch conditions. For some excitement with a stronger model, zoom off the winch into a loop into the clouds, and hold the elevator so that the plane continues to loop until the model is again visible. You can accumulate as many as 30 seconds of your flight time with this energy—with "occasional visibility"—before leveling out to continue your flight.

Interpreting the air in which you fly takes a good eye when you are in heavily overcast conditions. You have to know the normal attitude of your sailplane and be able to detect the slight differences you will see in very light lift. The lift conditions are similar to those you encounter on very humid days. When the air looks good, you must have patience with it. There are no strong thermals here. Don't forget the lift indicators you use on more pleasant days. There may be thermals, and you might see small birds feeding and hawks circling, and feel wind shifts

toward the thermals.

Of course, there is rain on these days, too. Rain may start during your flight. This can really impact the performance of a glider, so you should look to see from which side of the field the rain is coming and avoid the heaviest rain. It's a good idea for your spotter/timer to watch for rain and low clouds. You can ride good air downwind, but you can end up downwind with low clouds or rain coming, and that can drastically reduce visibility and your ability to bring back your model.

### WATER DROPLETS AND TRIM

Flight trim will change during a flight in mist or rain. Water does build up on the model, and the most obvious impact is a change in CG. When the model starts to stall and the flight is not smooth, don't hesitate to throw in a click of down-trim. You may need to do this more than once during a longer flight. Remember to return the trim to its original position after the flight.

If you are expecting rain during the flight, you might want to put in just a little extra nose weight ahead of time. You may find that some models' performances deteriorate badly with moisture on the wing. This depends on the airfoil, since the water drops change the airfoil surface and cause turbulence. The airfoil performance will often suffer, and some become really bad.

I hope these tips help next time you decide to fly on a less-than ideal day. If you're used to flying in beautiful weather all the time, too bad. You've been missing out on all this fun.

#### WET-WEATHER WEIGHT GAIN

I've been to a few contests this year in which the weather was overcast with occasional showers or continuous mist. For all sport fliers who would stay home on such days, these conditions are excellent for soaring. It is possible to get flights of 7 minutes with less than full launch height, and winning contests in these conditions usually depends on landing scores.

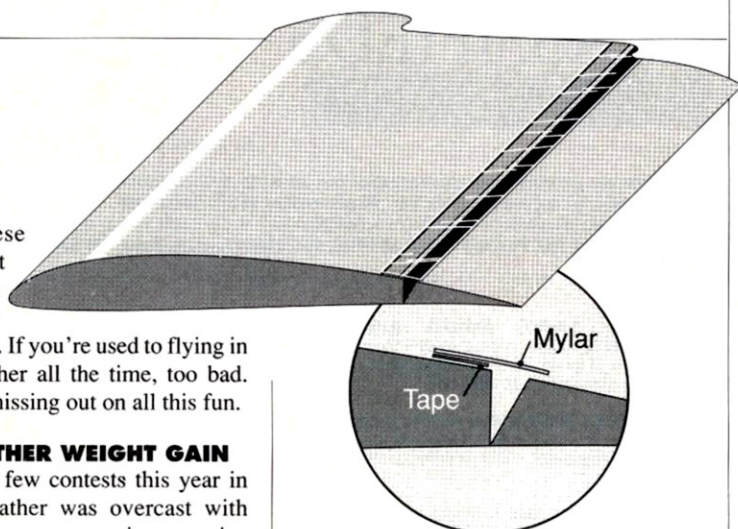
One problem: your model gets wet. This can have a significant effect on its performance. If you think a composite construction is any better than wood in this weather, you might be surprised at how much weight a composite model will gain in the rain.

The biggest impact is on the model's CG. This is usually manifested as tail-heaviness and increased pitch sensitivity—not what you need when the conditions require smooth flying. Plan to add a little nose weight to keep at normal trim positions.

Unpainted, vacu-bagged models have pinholes in their surfaces. These pinholes can accumulate water—under the worst conditions, as much as 1/4 to 1/2 ounce for each square foot of surface area. For a typical unlimited ship, you will need to add 1/2 to 1 ounce to the nose to maintain the balance position. For all HLG fliers, a composite HLG can pick up 1 to 2 ounces of water in wet weather. This is significant, considering that a competitive weight for an HLG is 13 to 14 ounces. This is a good reason to catch your model in early morning rounds when there is dew on the grass.

#### IMPROVE PERFORMANCE WITH GAP SEALS

One of the simplest control-surface hinges is a simple piece of tape. With this type of hinge, the control surface pivots about the surface where it is taped. The other side of



A Mylar strip seals the gap along the upper surface of a flap hinge.

the control surface then has a gap to allow for control movement. This gap disturbs the airflow and generates drag. You can reduce control-surface drag by covering this gap with a Mylar seal when the control surface is near its neutral position.

Seals made out of drafting Mylar are easy to add to a wing or tail. You need to buy some thin (3mil) Mylar from a drafting supply or arts supply store. You'll also need some Scotch double-stick tape (no. 136) to attach the Mylar. The Mylar gap seal is stuck to the wing with the double-sided tape. It overlaps the control surface 3/32 to 1/8 inch, and that keeps the gap covered for most small deflections. Don't overlap the control surfaces excessively, since the Mylar will then stick out too much when the control surface is deflected away from the Mylar.

Cut the Mylar into 3/4-inch widths for use as the seal. Put the tape on the wing or stab in front of the control surface, with its edges 1/32 and 7/16 inch away from the edge of the control-surface gap. When you are satisfied with the positioning, stick the Mylar onto the tape and rub it down. You can lift up the Mylar if you need to position it properly. If you don't like cutting your own Mylar and using the double-sided tape, Airtronics\* offers Mylar gap-sealing tape.

See you next month.

\*Here's the address of the company mentioned in this article:  
Airtronics Inc., 11 Autry, Irvine, CA 92718.

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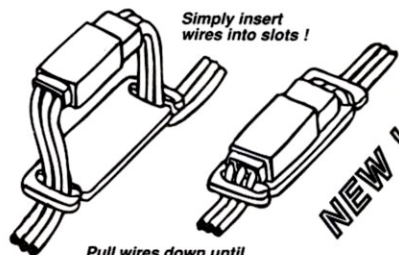


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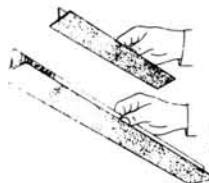


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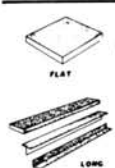
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## SCHLUTER

(Continued from page 130)

on Stan Olzaski and another pilot, whom I know only by the name given him by the announcer: "Dyno Boy." Olzaski and Dyno Boy brought out their Shuttle ZXs and had several drag races. This was the first time I had seen drag racing start from the ground rather than from a hover. It's a blast to see two equally matched machines racing with two equally crazy pilots!

Once again, I commend Dave Ramsey and the West Windsor Flying Club for hosting such a well-run event. I am looking forward to attending the event again next year. A special thanks goes out to Frank Heinrich and the people at Robbe/Schluter. Happy flying!

\* Here's the address of the company mentioned in this article:  
Miniature Aircraft, 2324 North Orange Blossom Trail, Orlando, FL 32804; (407) 422-1531.

## AIRWAVES

(Continued from page 9)

along in 1994/95/96, etc.? Did the manufacturers of these radios know of this regulation in early or mid-1992?

I am a member of the Boeing Hawks Model Airplane Flying Club and fly only for sport. However, as of 1993, it seems that I will be a spectator instead of a participant!

EUGENE "GINO" P. TURRELL  
AAMA. No. 428297, Kent, WA

Gino, your receivers are good and legal for a very very long time! I can only assume one of the well-intended "club experts" told you this. Your receivers are not only FCC-legal, but they will probably perform well, because they were bought in 1992 (many such radios include recent factory updates). These radios are being successfully flown in even more highly populated areas than the one in which you live.

The FCC is more concerned with what you are putting into the air, i.e., transmitting, than what you are taking out of it. The regulations for narrow-band receivers are as follows: as of March '92, only narrow-band will be manufactured; as of March '93, only narrow-band with be sold; and as of March '98 only narrow-band will be used. This has nothing to do with dual-conversion receivers; there are no regulations pertaining to this, and there is no reason your club should be enforcing this. AMA technical director Bob Underwood tells me these rumors come in waves and obviously cause much dismay. If your club has any questions, call the AMA at (708) 435-0750. CC

(Continued on page 138)



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## AIRWAVES

(Continued from page 136)

### HE'S HORRIFIED!

I was horrified to see how many magnificent R/C airplanes crash during shows. Has the R/C model community considered using parachutes to save their models? It is common in sport parachuting to have an automatic activating device (AAD) so that the parachute ripcord will be pulled at a minimum altitude. Such a sensor could be placed in an R/C airplane to deploy a parachute that would save the plane if it went out of control. Even simpler would be a panic button that the pilot could hit if things start to go wrong. The model could be decelerated for a survivable crash landing. **MIKE SPARKS**

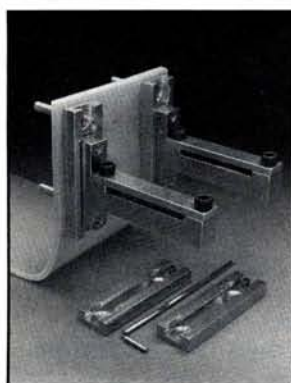
Bluefield, VA

*Mike, the Navillus Air Brake includes a nylon parachute that can be deployed automatically by signal from a "missing pulse detector/servo driver," or when the pilot wants to. The air brake does not require an extra servo and uses military-grade materials. The chute is matched to your plane's weight to ensure a gentle, wheels-first landing. There may be other companies out there with similar products. Contact Navillus Industries, HCR 1, Box 621, Sandia, TX 78383; (512) 547-5039.*

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## A D V E R T I S E R I N D E X

|                                       |                                     |                                    |                                     |
|---------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|
| Ace R/C.....135                       | Du-Bro Products.....52              | K&B Manufacturing, Inc. ....130    | Robbe Model Sport.....128           |
| Acro Star Productions .....50         | Dynaflite.....23                    | K&S Engineering.....97             | See Temp.....136                    |
| Aero Classics.....137                 | Eagle Miniatures.....136            | Key Hobby Enterprises.....138      | Sermos R/C Snap Connectors .....137 |
| Aeroloft.....136                      | Eldon J. Lind Company.....96        | Kress Jets, Inc. ....136           | Shields Aviation .....128           |
| Aerotrend.....125                     | Electric R/C Corp. ....77           | Kyosho.....35                      | Shop Task.....102                   |
| Airdrome.....114                      | Ernst Mfg.....133                   | L&R Aircraft.....77                | Sig Manufacturing .....60,138       |
| Airtronics, Inc. ....4                | Estes.....50                        | Lanier RC.....110                  | Sky Aviation .....98                |
| Alberta's Littlest Airport.....112    | 1st U.S. Flight School.....130      | M.A.N. Buyers' Mart.....115-124    | Slimline.....19                     |
| Altech Marketing.....C2,80            | Fiberglass Master.....97            | M.A.N. Customer Service.....97     | Smithy.....128                      |
| America's Hobby Center.....78-79      | Fox Manufacturing.....131           | MI Air.....58                      | Sport Flyers Association .....48,49 |
| Applied Design Corporation.....136    | Futaba Industries.....C3            | Midwest Products.....47            | Swenson Specialties .....136        |
| Astro Flight.....21                   | G&P Sales.....110                   | Miniature Aircraft.....106         | Super Tigre.....137                 |
| B&P Associates.....112                | Glennis Aircraft.....126            | Model Aviation Technology.....8    | Tatone.....85                       |
| Badger Air-Brush Co.....102           | Global Hobby.....87                 | Model/Tronics.....104,130          | Technopower II, Inc. ....125        |
| Balsa USA.....69                      | Great Planes.....C4                 | National Balsa.....97              | Telstar Video Productions.....137   |
| Bob Holman.....104                    | GRC Publications.....112            | Omni Models.....129                | TNR.....57                          |
| Bob Smith Industries.....3            | Hansen Videos.....50                | O.S. Engines.....103               | Top Gun Aircraft.....104            |
| Bob Violett.....107                   | Hobbico.....51,67                   | Pacer Technology.....74            | Tower Hobbies.....90-93             |
| Bridi Aircraft.....45                 | Hobbico/M.A.N. R/C Sweeps.....26-27 | Palmer Plans.....126               | United Model Distributors.....62    |
| Bruckner Hobbies.....41               | Hobby Lobby International.....28-29 | Peck Polymers.....9                | U.S. Aircore.....76,111             |
| Byron Originals, Inc. ....82,105      | Hobby One.....101                   | Pocket R.C. ....6                  | Usher Enterprises.....98            |
| Carl Goldberg Models.....59           | Hobby Shack.....36-37               | Proctor Enterprises.....130        | Vally Aviation.....102              |
| Charlie's R/C Goodies.....77          | Hobby Shop Directory.....131        | Radar Sales.....101                | Varsane Products.....133            |
| Classified Directory.....135          | House of Balsa.....113              | R/C Air Models Distributor.....104 | Video Specialties.....101           |
| Cleveland Model and Supply Co.....128 | Ikon N'Wst.....110                  | R/C Jobs.....137                   | Watkins Aviation, Inc. ....133      |
| Coverite.....6                        | Indy R/C.....15                     | R/C Launcher & Pit Crew.....114    | Wells Cargo, Inc. ....85            |
| Dave's Wood Products.....128          | ITP.....85                          | R/C Sports.....112                 | Williams Bros. ....114              |
| Davis Model Products.....98           | JD Model Products.....19            | Retailer.....101                   | Windsor Propellor Co. ....9         |
| Double M Electronics.....125          | JR Remote Control.....89            | Robart Manufacturing.....10        | WRAM Show.....127                   |